UP-CYCLING TEXTILES

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ABSTRACT

Upcycling Textiles is a project focused on utilising end-of-life textiles by building a hand-driven machine that turns textiles into ropes that can serve for a variety of purposes and products.

Textile waste is a growing problem worldwide. Until businesses move from a linear to a circular economy, where production is based on a closed-loop system to reduce waste and consumption of raw materials, we need creative ways to address the problem on a smaller scale. Upcycling is one of the ways to minimise textile waste when modifying unwanted materials into items of better quality and emotional value. While it does not solve the general issue of textile waste, it can be beneficial for individuals, especially when textile donation or recycling is not an option. However, the method of upcycling remains difficult if the person has little knowledge and skills. Thus, the core of this thesis is to show the potential of unwanted textiles, provide consumers with a more convenient way of upcycling, and share that knowledge with society.

The research consists of theory and practice. Various literature is reviewed to define upcycling and its origins, to provide current knowledge on textile waste and introduce the challenges of textile upcycling. The practical part of the thesis is conducted through observing similar upcycling and craft-based events in Finland. One thing these activities tend to have in common is community involvement, openness, and knowledge sharing. These qualities become the basis of the final work of this thesis. Practical research is also complemented by textile experiments that lead to rope making as the main method of reusing textiles.

The design portion consists of prototyping. After several trials and errors, a modern version of the rope-making machine is built and some applications of ropes are explored. Finally, the whole project is shared and presented to society through public events.

The project demonstrates the relevance of the chosen topic and the fact that ancient knowledge of rope making can be valuable in upgrading textiles. The hand-driven machine becomes a tool that connects people to the upcycling process regardless of prior knowledge or skill.

KEYWORDS: UPCYCLING TEXTILES, ROPE MAKING, COMMUNITY, TEXTILE WASTE, SUSTAINABLE DESIGN, DIY

CONTENTS

INTRO

CONTEXT

TEXTILE AND CLOTHING PROBLEM

Textile and clothing industries play a key role in our society. It provides us with curtains, furniture, clothing and many more things that we can hardly imagine our life without. Furthermore, such business gives jobs to millions of people worldwide. On the other hand, this industry generates a tremendous negative impact on the environment and society. Problems occur in a different stage of this industry: from growing crops for fibres and production to unethical and poor working conditions in the third world countries. Besides, the whole system includes resource and land use, pollution and emissions of greenhouse gases. On top of that, textile waste becomes a giant issue. European Union countries, for instance, made up more than two millions tonnes of textile waste in 2018 according to the most recent data on the Eurostat database (Eurostat, 2020). Only a small part of it is recycled while the rest of it ends up in landfills and incineration, which means a high environmental impact and loss of valuable resources held within the waste (Labfresh, 2017), (European Commision, 2017).

As a result, the EU has released legislation that every Member State will have to collect textile waste separately by 2025 and ensure that such waste is not incinerated or landfilled (European Commission: Environment, (2018)). However, these regulations do not affect people's habits to consume large amounts of textiles nor solve the problem globally yet. Much of used textiles are exported for resale in countries where the textile waste management is in poor condition and cause trouble for local communities. Kenya, in Africa, imports around 100 million kg of second-hand clothes mainly from Europe, Canada and the US (Africa Collect Textiles (ACT), n.d.). Even though some of the second-hand textiles find a home for a while but at the end, most of it ends up in overflowing dumping sites along the river banks, roads and neighbourhoods, or get burnt in the open air and cause health problems for locals (TEXTILE MOUNTAIN- THE HIDDEN BURDEN OF OUR FASHION WASTE, 2020).

Nevertheless, producers and the governing institutions are not the only ones to blame for the current situation. We, as consumers, support such a business model by overconsuming and treating textile products like disposable even if it is in good condition. Since it will take years for the textile business to become circular and labour fair, we must take actions by changing our behaviour. To begin with, we could avoid impulsive shopping. Next, we can reuse and repair textile products each time when possible to prevent the accumulation of textile waste in the first place. Only after that, items can be discarded for recycling or utilisation.

Textile waste in Kibera, Nairobi. It is the largest unofficial settlement in Nairobi and one of the impoverished slums in Africa. Photo Caitriona Rogerson

WHY UPCYCLING

In general, conversion of existing but unwanted materials into valuable objects can help reduce energy use and prevent large amounts of waste. Upcycling has always been prevalent in developing countries, where the need rather than an environmental concern fosters people to reuse objects. Noticeably, this activity is growing in the western world too, especially among businesses, like creatives in fashion and crafts hobbyists. A good example is Zero Waste Daniel, a professional brand in the US led by a young designer Daniel Silverstein who repurposes different scraps of discarded textiles into fashionable clothing. Globe Hope is a Finnish company that makes different bags and accessories from existing materials such as leftover fabrics from industries, recycled textiles and similar; army fabrics and seatbelts are very recognisable in their design. Freitag is another successful company from Switzerland that upcycles tarpaulin into very stylish bags and applies much of circular thinking in their business.

fig 4

fig 2

fig 3

fig 2 Globe Hope
fig 3 Freitag
fig 4 One of the items by Zero Waste Daniel

CHALLENGES FOR A CONSUMER

Companies mentioned above are successful because they are run by professionals who have expertise in the area. However, upcycling can be challenging among people without any experience and knowledge in dealing with various fabrics. For instance, what happens if a single individual wants to upcycle one's T-shirts? Will he have enough tools and materials or time to do it? Improvement of textile upcycling among consumers is one of the aspects addressed in the thesis.

MOTIVATION

Research requires efforts and time spent on, so one has to make sure that the subject is intriguing and motivating to work on (Muratovski, 2006, p. 29).

An intention to start the thesis starts from personal concerns on how humans live without respect to the planet and how the design field often creates problems than brings solutions. It forces to question the profession of a designer especially when there is a big focus on the beautification of design objects rather than real issues of climate change, hunger or for instance, fast fashion – spheres, where the creative mind would be a great asset.

My curiosity in upcycling comes from the early past. While developing the topic of the thesis, I kept returning to memories of my childhood when I used to transform old packaging boxes into the toys or upgrade some clothing items and accessories so that they would have more uniqueness or value to me. Plus, it would provide an opportunity to use

my imagination and creativity without fear to fail as those were just simple items nobody wanted to use. Besides, I had been surrounded by good examples at a younger age too. My grandma who still lives in the countryside reuses items and materials for every day's need: plastic bottles would serve as a way to scare away the birds in the garden; a wing of the slaughtered domestic goose, no matter how crucial it sounds these days, served as a broom in the past. Moreover, my father is keen on making things by himself, and one of his recent projects is a terrace roof that is made from reused advertising tent. These are just simple things that many people probably do without even thinking about the meaning of 'upcycling'.

An interest in textiles has particularly grown in the last years. Documentaries like The True Cost (2015), TEXTILE MOUNTAIN - The Hidden Burden of our Fashion Waste (2020), and RiverBlue (2016) and much of the information on different media affected me. At the same time, I was also curious about how a designer without any experience in fashion and textiles could contribute to the topic of textile waste. I always saw potential in soft materials as it is an excellent medium for art projects too. Soft Graffiti was one of the spatial installations for which I used unwanted textiles collected from the Fashion Department at Aalto University. Soft Graffiti is a reflection on traditional weaving that turned into the interventions in public space. The project took place in the brand-new metro stations of Espoo. Each stop was made of beautifully designed materials but did not have a warm atmosphere. In contrast, Soft Graffiti has brought more colours and homey feeling into the waiting area and has created a playful experience for passengers. During this project, I learned basic techniques and tricks of textile upcycling - making a continuous strip from sheets helps in the thesis work.

Thus, when the moment came to choose the thesis direction, I knew it was going to be between textiles and upcycling.

As a child, I often reused personal and household items:
top - the package of laundry powder turned into a barbie's car or other toys;
bottom - personal embroidery on the handbag

Matinkylä Mattby

Soft-Graffiti project

OBJECTIVES

RESEARCH QUESTION

The research should address a question that could make a difference in some way and bring new knowledge in the field by a new application or new ways of thinking (Muratovski, 2006, p. 28). Upcycling Textiles will not save the world but could raise awareness of existing textile waste issues and inspire people to make sustainable choices. The core of the thesis is to show the potential of unwanted textiles and enable people for textiles reuse. The main research questions are set:

How to improve the upcycling of discarded textiles on a consumer level? How to make this knowledge available to society?

The question consists of 2 parts. The first part seeks to find a convenient way to improve the value of discarded textiles through the upcycling process regardless of one's skills and knowledge. Meanwhile, the second part seeks an impact on society by sharing the gained knowledge to the public.

Preliminary outcomes:

- Upcycling machine and upcycled samples or artefacts
- Upcycling workshop
- New knowledge
- Sharing gained knowledge with the public

STRUCTURE OF THE THESIS

The thesis consists of five main sections: theoretical and practical research, design part, sharing gained knowledge with the public and final conclusions.

Different methods are applied to each part of the study. The literature review, as the main method of theoretical research, provides current information on upcycling, the definition of textile waste, and introduces us to the case study.

Practical research includes observations and hands-on experiments. The former is based on qualitative research (Muratovski, 2006, p. 64) as I observe sustainable practices and businesses through my participation in different events and workshops. In contrast, initial experiments and design part are built on action research. In the early stage of my work, I conduct a few tests on textiles. Then, these experiments take me to the design phase throughout which I build several prototypes of a rope-making machine. All processes are then depicted in the text and presented with the photographs.

The thesis is complete with an artefact and new knowledge, which is presented to society at public events. The section of conclusions summarises and evaluates the project at the very end of the thesis.

METHODS

LITERATURE REVIEW

A literature review is a starting point to a better understanding of the thesis topic and its context. This method is used to answer the following questions:

- What is upcycling? What is a short history of upcycling?
- What is textile waste?
- What are the current examples related to upcycling or sustainability?

Answering these questions is an important development of the thesis. It helps to discover problems and potentials lying in the field of the interest and brings ideas of what contribution a thesis project can make. A review is drawn from primary sources according to the same thematic. Different books, online articles or journals, original documents or documentaries are reviewed and analysed.

OBSERVATIONS

Through participation in local events related to upcycling and crafts, we can observe and gain a better understanding of sustainable design practises and people who are interested in such a field.

The following questions to answer:

- How different organisations carry out the workshops and their sustainable business?
- What are the areas that these studios and organisations focus?
- What are things common among these organisations?
- What kind of people gather in upcycling workshops?

The goal of participation in local events is to meet like-minded people, obtain valuable information and learn from real-life examples. Four events are visited and evaluated in the text later.

EXPERIMENTS

The whole hands-on practice is based on learning by doing. This part follows action research that, according to dr. G. Muratovski (2006) can also be considered a practice-based study. He also presents action research as “an examination of the way in which practitioners reflect on their actions during and following their work” (p. 192). Even though in many cases action research should engage in collaboration with other researchers or relevant stakeholders, at the end it can be flexible and eclectic; it might be an individual work based on one person’s activity (p. 196). Therefore, experiments and prototyping are carried out through the cyclical process that consists of preliminary

diagnosis and planning, taking actions and learning from it by the revision of outcomes before undertaking the next step again (Fig 5). As a result, practical research and design phase is accompanied by articulated experiments and photos so that it is understandable for a wide range of people and not only to experts, who have a trained eye to read design from the first glance (Vaughan, 2017, p. 38). In the end, both the final artefact and gained knowledge are equally important.

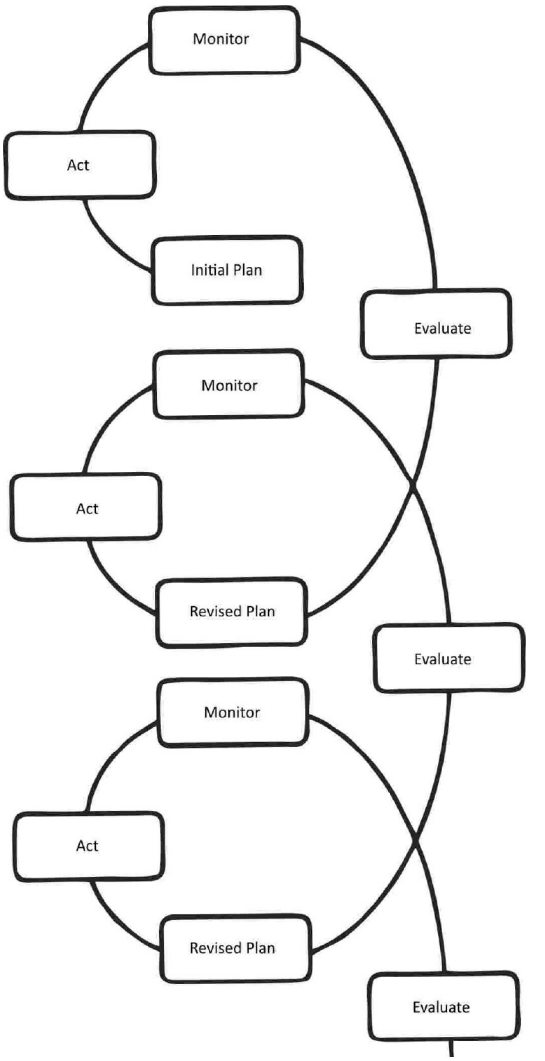


fig 5 Explanation of action research

THEO-
RETICAL
RESEARCH

WHAT IS TEXTILE WASTE?

“Knowing where our clothes come from is important, but it is equally important to know where they go at the end of their life”

(Yoon, 2020)

This quote asks us to think more thoroughly about the whole system related to fashion and textile industries and pay attention to what happens for unwanted items and materials at the end of their lives.

It is estimated that clothes bought in the EU have increased by 40% in the last few decades, with the prices falling by 36% (Šajn, N., 2019). One of the contributors to such numbers is Fast Fashion that produces more clothes than we need and sell them for a lower price and poorer quality as well. That determines a short lifespan and accumulation of various waste that is hard to cope with. Unfortunately, innovative recycling methods are still emerging, and there are complications surrounding textiles that combine synthetic and natural fibres. Many times, mechanically recycled materials are converted not into new clothes but acoustic panels or other construction materials instead (Šajn, N., 2019, p. 5).

Textile waste itself is a material that the owner considers unfit for its original purpose (Redress, 2019). Textile waste usually includes waste from the fashion and textile industries generated during the production of fibres, textiles and textile products; and waste generated by a consumer. Due to that, waste is divided into pre-consumer waste, that accumulates during the production phase before reaching a customer; and post-consumer waste, that accumulates after consumer's disposal and use (Redress, 2019).

SOME EXAMPLES OF PRE-CONSUMER WASTE ACCORDING TO REDRESS (2019):

- Leftover textile samples;
- Cut-and-sew textile waste;
- End-of-roll textile waste;
- Damaged textile waste (unfinished textile materials with certain defects);
- Sampling yardage waste (factory surplus material remaining after the production of textile samples);
- Clothing sample waste (samples of clothing left from the design or production stage of clothing);
- Unsold clothing waste

SOME EXAMPLES OF POST-CONSUMER WASTE ACCORDING TO REDRESS (2019):

- Second-hand clothing waste (discarded by a consumer);
- Second-hand textile waste (such as furnishings, curtains etc., non-clothing waste that has been discarded by a consumer).

WHAT IS UPCYCLING?

In order to commit a thorough project we need to understand the field of upcycling. This section presents current knowledge about upcycling in general.

Waste, as often said, is a design flaw. In a perfect world, every item and system would be designed in a way that there is no waste: every material would circle in the system or decompose and become food for other organisms just like in nature (Braungart, M. McDonough, W., 2009, 92p.). Whereas in the real world we are still generating waste and trying to find ways to manage it.

Me as probably some other individuals quite often find guilt when it comes to throwing things away, whether it's a piece of cloth or some packaging. To avoid contributing to the production of waste we can apply the philosophy of 4R's mantra when possible, that means: reduce (or refuse), reuse, recycle and recover. Upcycling is usually placed next to the term 'reuse' and should only be applied when we first tried to reduce consumption or change some negative habits that may harm the planet.

Upcycling is usually described as a practice when something disposable and unwanted is transformed into something of the higher value and use (Edwards, 2015, p. 9). It can also result in greater emo-

tional value and attachment. The term “upcycling” was introduced in 1994 by German engineer and upcycler Ruiner Pilz in the article for “Salvo Monthly”, where he confirmed that “we need upcycling, where old products are given more value, not less” (Kay, 1994). A few years later in 1999, G. Pauli and J. F. Harthemeyer published a book with the title “Upcycling”. The concept was later discussed in the book “Cradle to Cradle: Remaking the way we make things” by William McDonough and Michael Braungart issued in 2002. According to these authors, upcycling – is to prevent wasting potential materials by making use of existing ones (Braungart, M. McDonough, W., 2009).

ADVANTAGES

There are three positive things that I came across upcycling. First, it can have a positive impact on the environment; second, it brings an emotional value and, third, it is beneficial for well-being. These subjects are discussed further in the text.

To begin with, not all people are aware of the difference between recycling and upcycling (Braungart, M. McDonough, W., 2009). In contrast to recycling, materials do not have to be broken down in the upcycling process. They are modified, enhanced, combined and converted into projects of a higher aesthetic, environmental or emotional value (Edwards, 2015, p. 9). Such a conversion can contribute to the reduction of waste, energy and raw materials as the lifespan of the object is expanded, and there is no need for new resources.

Furthermore, reused items have strong emotional power. Such objects have a story to tell that gives it an additional value. They look

authentic and unique, usually handmade and original as a contrast to mass products worldwide. On top of that, a good example of upcycling can change people's perception of unwanted materials or their consumption habits.

Moreover, being an "upcycler" can make a positive impact not only on the environment but on well-being too. The action of making fosters creativity and excitement. It is full of improvisation and working with hands. The process lets one focus on the present moment and helps one lose personal thoughts; in other words, one might experience the flow – a complete immersion in an activity. Plus, one can feel rewarded after finishing an upcycled object (Tew, 2019).

DISADVANTAGES

Through the analysis of different digital platforms such as Etsy, Youtube, or social media, I find myself thinking about the limitations and challenges in upcycling. These findings are uncovered in the following text.

Upcycling requires creativity and patience. For example, one must be a careful listener to read unique qualities and potentials lying in the item that needs an upgrade. Sometimes, it has more to do with restrictions rather than with freedom. The style and limited amount of available discarded materials determine the final design of the artefact. To be innovative in such a case is more demanding than creating something new out of scratch.

ISSUES OF TEXTILE UPCYCLING

Unfortunately, not all discarded textiles are of high quality and easy to reuse and upgrade. This can lead to poor quality upcycled items, unattractive appearance or a short life span afterwards. While it may still have an emotional value and personal connection to the maker, however, that would not be enough if one would like to sell things and run a small business. Besides, low-quality upcycled items could set a poor reputation and demotivate people from engagement with upcycling.

Moreover, unwanted textiles and clothing need preparation and processing of the material before the actual action of upcycling starts. It can be time consuming and determine a higher price for the upcycled item.

End of life textiles are very often used in making items that require some crocheting or sewing skills. Upcycled clothes and rag rugs are just a couple of examples. Because of that, the field of textile upcycling is rather associated with women than men. This is especially noticeable when searching for related information on YouTube channel or DIY blogs. As a result, upcycling textiles is often pictured to be more feminine among hobbyists. Thus, we need ways that make upcycling of textiles equally interesting to everyone, regardless of gender.

Preparation work by VA IR VA KAIP, a brand that turns discarded denim into children's swings and accessories, admits on their social media that abandoned materials require a lot of preparatory work before they actualy can start a project. Photo: VA IR VA KAIP

CASE STUDY

PRECIOUS PLASTIC

One of the most remarkable and global examples of taking sustainability and circular thinking into account is “Precious Plastic” project founded by Dave Hakkens in Eindhoven, The Netherlands, in 2013 (Precious Plastic, 2020).

It involves DIY machines that let anyone recycle plastic waste into new products. It is an online open-source, which educates, shares the knowledge and spreads information on how to tackle the plastic waste by merely setting up the workshops, connecting and growing the network and community. Currently, more than 1000 people and groups work with Precious Plastic machines around the globe and involve over 80 000 online community users so far (Precious Plastic, 2020).

Besides, being online and available by anyone in the world, Precious Plastic might have a few more reasons beyond its popularity. First, the project is educating and motivating. It raises awareness of various plastic problems and teaches the audience. Second, it offers

a concrete solution to the raised problem - the establishment of the local workshops where plastic can be recycled. Moreover, it enables users to feel like designers as they can create unique and aesthetic items that can be also profitable.

Overall, Precious Plastic is a unique project that works across on-line-offline communities. This is a great example of upscaling a project through a small social business that operates locally but acts globally.

fig 7 Recycling machines and artefacts by Precious-Plastic

PRACTICAL RESEARCH

OBSERVA-TIONS

In this chapter, I reveal various observations from attended workshops. An intention to take part in these events around Helsinki stems from a desire to know how different people and organisations carry out sustainable and social design practices. Besides, gathered information and learnings are beneficial in the further development of the thesis. There are four workshops discussed in the following section.

JOOSOAP

#EDUCATIVE #IMPACTFUL #OPEN-SOURCE #ENGAGING #COMMUNITY #LOCAL-GLOBAL

JooSoap is a studio spreading its knowledge on making ecological cleaning soap from used cooking oil. This studio works not only locally by arranging the workshops, selling their products but also share the recipes online. Interested people can become the ambassadors of JooSoap and teach locals to make a soap regardless of their ge-

ographical location. In this efficient way, the organisation builds a community all over the globe. What is more, the studio collaborates with local Helsinki restaurants in order to collect used cooking oil from their kitchens. Initially, this project had originated in Japan and Taiwan and was introduced by Ying-Ju Lin under the label of JooSoap in 2011, Helsinki, and still continues (JooSoap, 2018).

SOAP MAKING WORKSHOP

I had a chance to witness a JooSoap event by myself during Helsinki Design Week 2018. The workshop consists of 3 parts: the introduction about the studio itself, the presentation of environmental issues caused by used cooking oil and participation in making soap. The recipe is quite easy to follow and does not require particular skills. When the soap liquid is ready, it needs to be poured into a mould (used kitchen containers are the preference) and left for 2-3 days to solidify and up to 4-6 weeks to dry off until it is ready to use. After finishing the workshop, one can choose to pick up a ready-made soap bar or wait a few weeks to pick one's own.

REFLECTIONS

I was happy to gain new knowledge about the field and learn how to make soap. It is a practical skill that can always be applied at home in the future. Furthermore, I enjoyed the teamwork and company of other participants of all ages who were also interested in sustainability. Overall, an inspiring workshop set a good example that even cooking oil can be upcycled.

Aromatic ingredients can be added to the soap

Ready-made bars of soap

JooSoap workshop. Photos (top, bottom): JooSoap

UPCYCLE WITH JING

#UPCYCLING #CRAFTS #MEDITATIVE #SINGLE-USE PLASTIC

Upcycle with Jing is a project run by Jing Wang. She is a multidisciplinary designer who among other things like upcycling or handicrafts, creates unique jewellery from single-use plastic and unwanted materials. Jing occasionally arranges the workshops and shares her knowledge of such crafts.

PLASTIC BAG CROCHETING WORKSHOP

Upcycle with Jing offers four different workshops. Plastic bag crocheting was the activity I participated during the same Helsinki Design Week in 2018. Initially, participants are taught to cut a plarn from the plastic bag and try out crocheting. The instructions are easy to follow if one has experience in similar crafts. Otherwise, it can be time-consuming and challenging. The result is a small crocheted piece, that can serve as a coaster or be upscaled into a purse or similar application.

REFLECTIONS

Transformation of the plastic bag into the yarn for this type of craft was new to me. It revealed new ways of how plastic bags can be upcycled. However, I was not happy with the outcome as it did not appear to be so handy. Hence, it made me question the whole idea of such a method. On the other hand, the workshop was not about achieving outstanding results but getting familiar with the technique instead. In short, the experience was positive in terms of the process and working with hands.

Upcycle with Jing workshop

TRASH DESIGN

#INVOLVING #CREATIVE #EMOTIONAL VALUE #STATEMENT

Trash Design is a collective run by a curator-designer duo Henrik Enbom and Isa Kukkapuro-Enbom. Both creators try to address consumerism and environmental issues in their activities. The collective mainly focuses on making objects from trash or hosting workshops, among other exciting things like interiors, publications and curation of the exhibitions related to sustainability.

INTRODUCTION TO TRASH DESIGN

Meeting this creative duo was necessary, as I knew my thesis relates to the topic of their interest. Actions and works of Trash Design are encouraging, and it was a good opportunity to see how a real-life example works. It was clear that Henrik's and Isa's life philosophy resonates with my design values, and later on, our meeting turned into an idea that I should take part in one of their organised workshops with schoolchildren.

FROM TRASH CHAIR TO A STATEMENT CHAIR WORKSHOP

The event took place in Kerava, Finland. The school of Keravanjoki had a lot of old chairs they wanted to get rid of. However, the chairs were in good condition just needed a minor upgrade to save them from throwing away. Our participants were the students from an international education line.

The workshop consisted of theory and practice. First, Isa gave a lecture on Trash Design and the importance of sustainability. Then, the objectives and instructions of the workshop were presented, and the actual

FROM TRASH CHAIR TO A STATEMENT CHAIR workshop

work began. The main task was to decorate the chairs with different types of collages that were cut from old magazines, brochures or booklets. The cut-out pieces would be glued to the chair as a new upholstery with children's message.

After completing the work, students named each chair according to the main artistic idea and presented it in front of the class. Each chair was unique and had a different approach, from a humorous to a philosophical statement.

REFLECTIONS

Giving a new life to unwanted furniture was exciting. We established an emotional connection between the students and the artistic object - the chairs. I am happy that students had the opportunity to bring their voice out through such a form of making. Plus, this furniture is likely to be valued and taken better care than before the remodelling. However, we can question the glueing of paper as it may not be the best solution in the long run. Perhaps repainting would have been more practical and long-lasting, but more time-consuming and possibly requiring special space to implement.

A FEW SELECTED STATEMENTS FOR CHAIRS:

- Ihaile luontoa (Admire nature)
- Älä häpeä kehoasi (Don't be ashamed of your body)
- Ruoka, naiset, mielenterveys, meemit ja amispoppi (Food, women, mental health, memes and amispops)
- Säästä luontoa (Save nature)
- Vanilla Ice-man, ole kuin hän (Be like Vanilla Ice-man)
- Sunset oranges, feelings it gives you

VERSTAS 247

#INVOLVING #MEDITATIVE #CRAFTS #HOBBYPOINT #KNOTS

Verstas 247 is a social enterprise in Helsinki. It is a community that unites all people interested in crafts. Their premises are rich in a variety of equipment and materials such as fabrics, yarns and similar. There is a possibility to be a regular member to use the space or attend the workshops and courses arranged by crafts enthusiasts. The whole concept is to share the materials and knowledge between each other and build crafts and DIY culture. These people contribute to sustainability in the way of making their items and not buying new stuff that would be of a short lifespan or produced thousands of kilometres away.

MACRAME WORKSHOP

I have attended a macramé workshop a VERSTAS247. I have always found this technique inspiring and wanted to learn the basics. A plant holder was an object that we managed to make in a few hours session. It was intense handwork that required a full focus when tying the knots. There were two participants, including myself and another woman, so we received a lot of attention and advice from the workshop host. A cotton cord was the primary material and a metal clothing rack served as a support for the plant holder structure.

REFLECTIONS

To sum up, the process was very meditative and relaxing. The staff was friendly and open-minded. Whereas the result itself is very satisfying and not difficult to achieve; a plant holder found its place at my home and made it even brighter. Learning knots was a practical lesson that can be

applied later in the future, especially in the thesis.

The knots learned:

- Half knot
- Square knot
- Singe half hitch
- Double half hitch
- Berry knot/pea knot

A plant holder made at Verstas247. Photo: Nina Myllymäki

CONCLUSION

The summary of the workshops

The table on the opposite page gives a summarised information about four workshops and organisations.

Each workshop was different but related to upcycling or sustainability. However, only two of the four organisations named JooSoap and Verstas247 are very community-oriented, the other two are more independent from the community. Meanwhile, the open-source concept is more common in activities of JooSoap and Upcycle with Jing, as they share much of their knowledge online. The most interesting observation drawn from the table is that women were the main participants in all the workshops. Moreover, the most expensive workshops organised by JooSoap and Verstas247 had the most satisfying and practical outcome. Last, each organisation has its website and social media, but Verstas247 is the most active one, as they depend a lot on a community to keep their social business alive.

Overall, organisations address issues related to sustainability in their daily activity. Attended workshops have proved that the involvement of society is vital to raise awareness about the environment and make an impact on people. In the end, it shows that the chosen thesis topic is also relevant in the current context as four existing organisations and studios have been overviewed. Attending the workshops was a great opportunity to meet so talented and like-minded people that it motivates me to push the thesis even more forward.

Organisation / Studio	JooSoap	Upcycle with Jing	Trash Design / Dodo	Verstas 247
Workshop tittle	Eco soap making	Plastic bag crocheting	From Trash Chair to Statement Chair	Macrame workshop
Sustainability driven	+	+	+ / -	+ / -
Community driven	+	-	-	+
Open-source	+	+	-	-
Participants	women (students, employees) up to 40s & children	women (mainly students) up to 35 years old	school children, boys & girls	two women (myself including), late 20s & 60s
Result	cleaning soap bars and liquid; used at home	a small crocheted plastic piece, no use	upcycled chair; not clear if chil-	plant holder; used at home
Duration (hours)	2	2	3	3-4
Team work (relation with other participants)	teamwork, intense	individual	groupwork	individual
Price	20 eur	4 eur	0 eur	45 eur
Social & other media				
FACEBOOK	periodically active	periodically active	rarely active	SUPER active
INSTAGRAM	periodically active	periodically active	rarely active	regularly active
YOUTUBE	periodically active (a few open	periodically active (a few	not active	rarely active
WEBSITE	periodically active	periodically active	passive	periodically active

The summary of the four workshops

FIRST EXPERIMENTS WITH TEXTILES

This chapter presents early experimentation with unwanted textiles. The reason behind such exploration comes from a need to define a more clear thesis direction. Since very often, fabrics are upcycled into another piece of clothing or a carpet; there is a curiosity to try out textiles as a building material for everyday interior items rather than fashion or similar objects that we are used to.

CROCHET AND GLUE

Exploration of textiles starts by getting familiar with different fabrics left from earlier projects and second-hand stores. It helps to understand the possible usability of the soft material. First, an old fabric

yarn is turned into a small lampshade by crocheting. Then during the second test, the fabrics are shaped into different forms using glue.

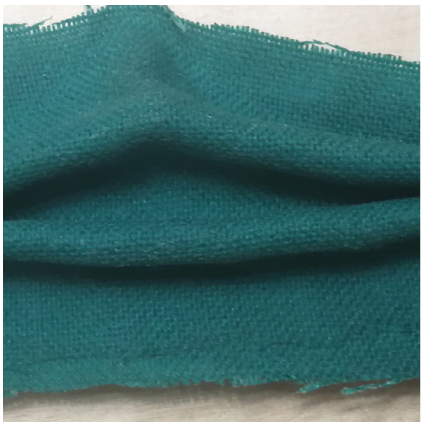
The results of the two tests are good enough, but several problems prevent further development. To begin with, the outcome of the first test depends directly on the material itself; for example, if the fabric is not sturdy but weak, then a crocheted piece will have the same poor quality. The latter test is more promising as any soft material becomes firm after coating it with glue; however, the whole process is somewhat controversial since glue destroys the fabric irreversibly and contradicts with the concept of upcycling. Aesthetics of the final pieces are not as worthy or sustainable to be brought to another level.

ROPE

It clears out that the problem lies in the properties of the textiles after conducting experiments mentioned above. Fabrics often have ripped edges and can tear easily when more strength is required. In contrast, a yarn consisting of interlocked fibres is a good example of strength. Simply each fibre is fragile, but when intertwined together, they form a substantial piece of the yarn. Following such a model, a few individual strips of fabric are twisted into a rope manually when running a new test. Even though a final result does not look so pleasing, but the whole piece is more durable and reliable than the individual strip. After all, this technique seems promising and needs a further improvement that is done in the next phase of the work.

Crocheted piece

Coating fabrics with glue



Coating fabrics with glue

Coating fabrics with glue

Coating fabrics with glue

A manual rope making

A BRIEF BACK-GROUND OF ROPES

Previous experiments show the need to explore the background and specifics of ropes and their production, as making of ropes is chosen for further development.

THE PAST

The production of ropes or cords is one of the oldest human crafts dating back to prehistoric times. It is known that ropes have been widely used in hunting, carrying, stretching, moving heavy objects, climbing and fishing for a very long time.

fig 9

fig 8

fig 8 Cave painting showing a honey gatherer using a rope ladder 6000 BC
fig 9 A papyrus rope from Ancient Egypt

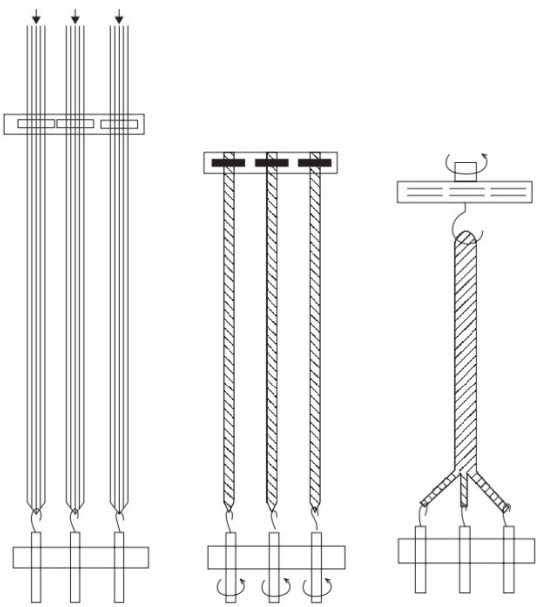


fig 10 Explanation of making a three-strand rope

One of such rare findings is a papyrus rope from Ancient Egypt dating 2613 - 2160 BC (fig 9) that had been used for moving the blocks of stone (Rammcollections, n.d.). However, such objects are rarer to find as many of them have decayed along the time since it was made from local natural fibres such as grasses and vines (McKenna, H., Hearle, J., O'Hear, N., 2004, p. 1) and only pictorial records can give more information (fig 8).

ROPE MAKING

People used to make ropes by twisting the fibres by hand, but later on, they develop more advanced hand-driven systems made from wood. The ropewalk, which is known as a covered lane - building, used to be commonplace for rope making but simpler tools were also suitable. Usually, it would have a jack (or a driver part) that has hooks that are rotated by a handle and a carriage (or a traveller) that has a single rotatable hook. A topper is a third element that is placed between the strands to prevent them from kinking during the twist (McKenna, H., Hearle, J., O'Hear, N., 2004, p. 5).

The making process involves a few steps. In step one, yarns are attached to the hooks at both ends of the ropewalk (a jack and traveller). In stage 2, a person turns a handle of the jack, which makes the hooks spinning and yarns turning into strands. Such a twist causes a strands' length decrease due to which the carriage starts to move towards the jack. In stage 3, the hook on the carriage starts rotating due to a torque caused by strands twisting, so separate strands twist together into a final rope (McKenna, H., Hearle, J., O'Hear, N., 2004, p. 5).

fig 11 A topper, that separates the strands

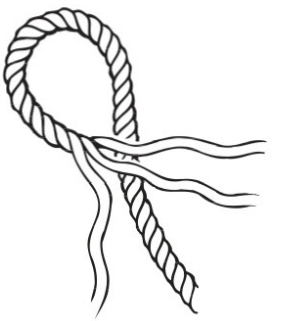


fig 12

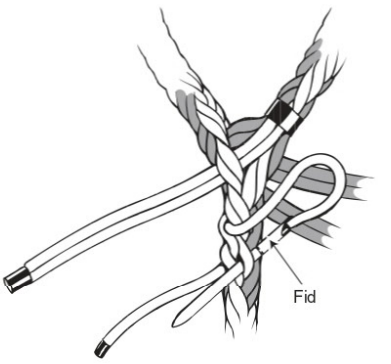


fig 13

Fig 12, 13 - An eye splice termination for a 3 strands rope

However, a hand rope making process is replaced with automated machines during the Industrial Revolution around the 19th century (Hill, 2012, p.128). Also, synthetic fibres like nylon, polythene and others, take over natural materials as they are cheaper and stronger to produce.

TYPES OF ROPES

There are laid - twisted and braided - plaited types of ropes. The braided one is made by braiding eight and more fibres into a tube-like a braid, and a laid rope is made by twisting fibres into strands and twisting them into a rope. Three-strand ropes are the most common ones (Kenninger, 2019) that are also produced in the thesis project later on.

SPLICING

Finishing the loose ends of the rope is important as it can be one of the weakest points. Such termination can be done by tying a knot, wrapping around a post, attaching the tape, or using a splice (McKenna, H., Hearle, J., O'Hear, N., 2004, p. 215). The latter is one of the most efficient ways to keep a rope strong. There are different ways of splicing: an eye splice (making a loop); an end-to-end splice that can be used as joining two ropes into one; and joining the ends of the same rope - making an enclosed – circular rope.

An eye splicing seems to be a very common way that is done by separating the strands at the end the rope; then bending them into a loop shape, and interlacing those ends-strands into the body of the rope. This process is called tucking (fig 12, 13).

CURRENT DAYS

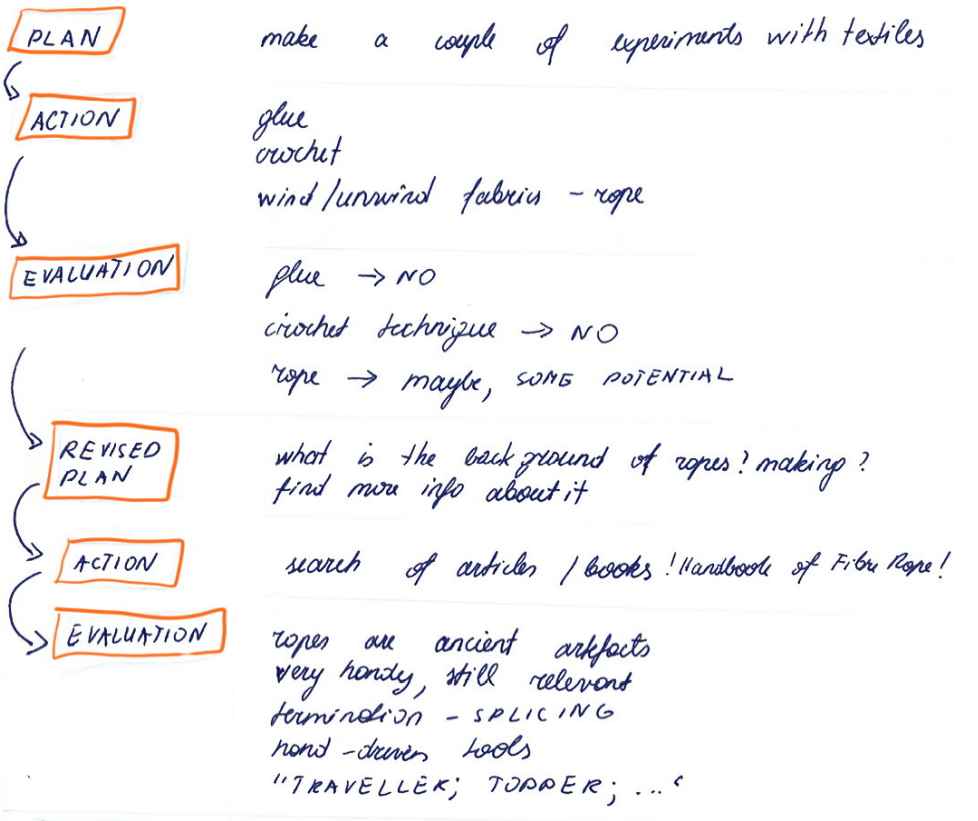
There is a big demand for ropes these days. The only difference from the past is that ropes are made in automated systems and have to meet higher requirements and engineering needs for such applications like mooring, or any other heavy-duty like elevators. There is also an everyday use in climbing, sailing one can name it or more traditional applications like fishing nets.

CONCLUSION

The text has introduced us with tools, terminology and nuances of the rope making process. In the past, people used manual tools to make ropes. Yet, automated machines are more widespread these days and meant for heavy-duty applications. Information of this chapter proves that a rope has played a crucial role throughout the years and still stays relevant. Learnings of splicing, manual tools are taken into account for the next stage of the thesis.

EXPERIMENTS

BACKGROUND



The relation between conducted experiments and background of ropes

DESIGN PART

This chapter summarises the journey of creating mock-ups of three different rope making machines based on the learnings of theoretical & practical research

MOCK UP 1.

AUTOMATED MACHINE FOR ROPE MAKING

There are usually two systems used in the manual rope making machines: gear system and a belt-driven mechanism. The former seems to be more of a challenge and requires at least two people to handle the making process while the latter looks faster to build. Since there is a need for a quick test to check if rope making is a good idea, a belt system is preferred for the first trial.

After a search on the YouTube channel, a suitable DIY tutorial conducted by Grant Thompson is found. In several videos, he explains how to make a cord by building up a simple machine from simple materials on The King of Random channel (Thompson, 2017). The machine is based on a belt-drive mechanism and needs only one person to handle an automated system, so it perfectly suits to the experimentation with ropes.

Many of next steps are based on the found tutorial with some interpretations.

MATERIALS

METAL PARTS:

- Eyebolts W/Nut (150 mm long, 5 mm diameter), 3 pcs
- Fender washers bigger and smaller in size (bigger than the plastic wheel diameter)
- Cut washers, 9 pcs
- Hex nuts for eyebolts

WOOD PARTS:

- 160 x 210 mm board, 3 pcs
- 50 x 50 x 260 mm beam, 3 pcs
- 50 x 50 x 160 mm beam, 1 pc
- A small rectangular piece of wood for the topper

OTHER PARTS:

- Plastic Castor wheels, 3 pcs
- Belt – rubber band or inner tire of the bicycle wheel
- Swivel hooks 2 pcs
- A plastic bottle full of water or any other similar counterweight
- A cord
- Straws, or any other tube for the cords, 2 pcs
- (Electric) tape

THE PROCESS

PART 1. THE SPINNER BLOCK

1. WOOD PART

1.1 The leftovers of chipboard and plywood beams are chopped into the proper sizes.
1.2 Three washers are aligned on the board to mark its centres.
1.2 The two boards are clamped up together, and then the holes are drilled through the previously marked centres.

2. METAL PART

2.1 Eyebolts are made manually: the rods of 5 mm thickness are cut into a length of around 200 mm, then, the rods are bent into a bolt shape after sanding its heads and last, the ends of the bolts are threaded.
2.2 The metal parts are removed from the plastic wheels. Plastic wheels function as pulleys for a belt drive mechanism.
2.3 Three holes are drilled on each of three fender washers; they will be attached on the outer side of the board so that the bolt hook does not damage the board surface when pulled.

3. RUBBER BAND

A local bicycle shop in Tapiola, Espoo, has given away an inner tire of the bicycle wheel, that is perfect for building the prototype. However, the diameter of the tire is too short for the three pulleys, so it is cut along the tire and sewn by hands to create a belt of the right length.

4. METAL CAP

A metal cap is made and placed to the eyebolt so that the thread of the eybolt does not warn out when the drill jaw is attached during the making process.

5. ASSEMBLING

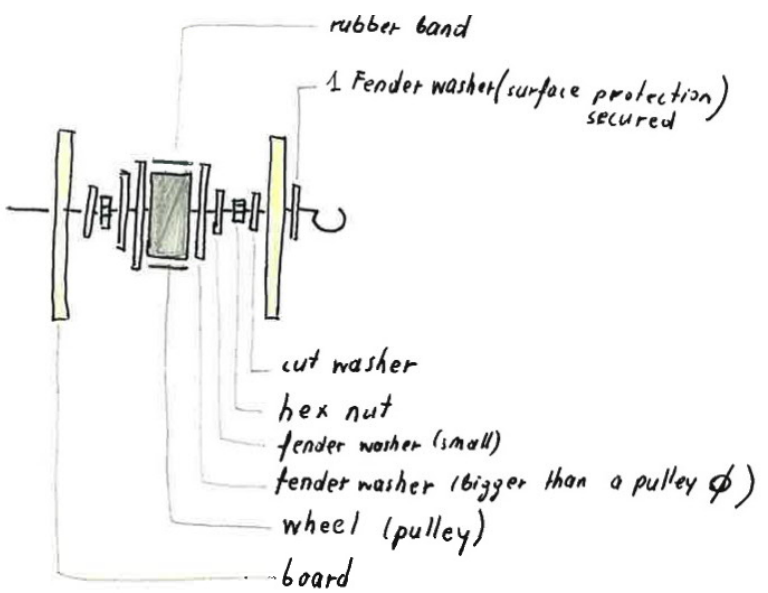
The belt drive mechanism is assembled according to the scheme in the sketch below.

5.1 Three washers are attached to the outer side of the board to protect the surface.

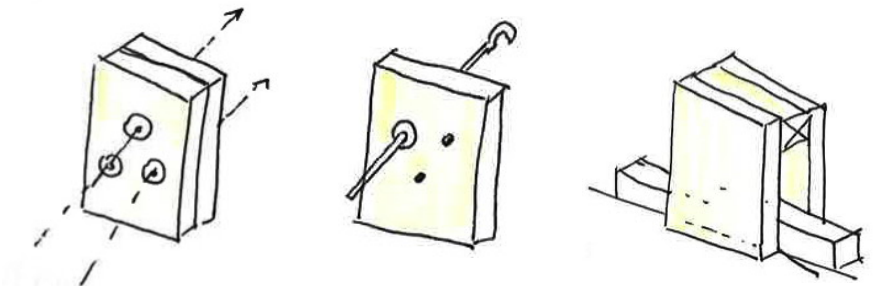
5.2 The three bolts are pushed all the way through the holes of the board.

5.3 Cut washers are put from the inner side of the board on the bolt, and the nuts are tightened up strong.

5.4 Fender washers are lined up in place, and three pulleys (plastic wheels) are assembled on the bolts while the rubber band is looped all over the three wheels-pulleys.



Sketch 1.



Sketch 2. The spinner block

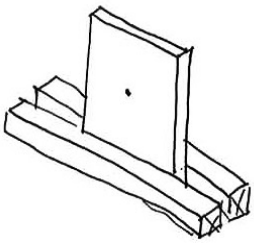
5.5 The same arrangement of washers and nuts is repeated on the other side of the wheels, and the second board is attached so that the spinners are straight and steady.

The whole piece is finished when two beams are placed between the boards. The 160 mm beam is attached on top, and the longer one of 260 mm goes on the bottom. The latter one has flanges that serve for clamping.

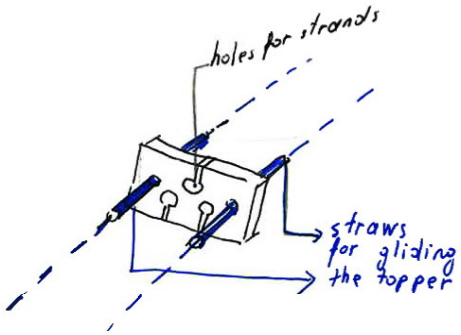
PART 2. THE SUPPORT BLOCK

The second part accommodates a board supported by two beams, a counterweight, a topper, two swivel hooks and other smaller details.

1. Three holes are made in one line on the board. The middle centre is used for the counterweight, while the other two for the upcoming cords holding the topper.
2. Two long beams of 260 mm are screwed on both sides of the board to create strong support.
3. A water bottle is attached to the string and functions as a counterweight.
4. To alleviate the tension accumulating during a rope making the two swivel hooks are attached to the counterweight. According to the tutorial by Grant Thompson, a counterweight rises every time the



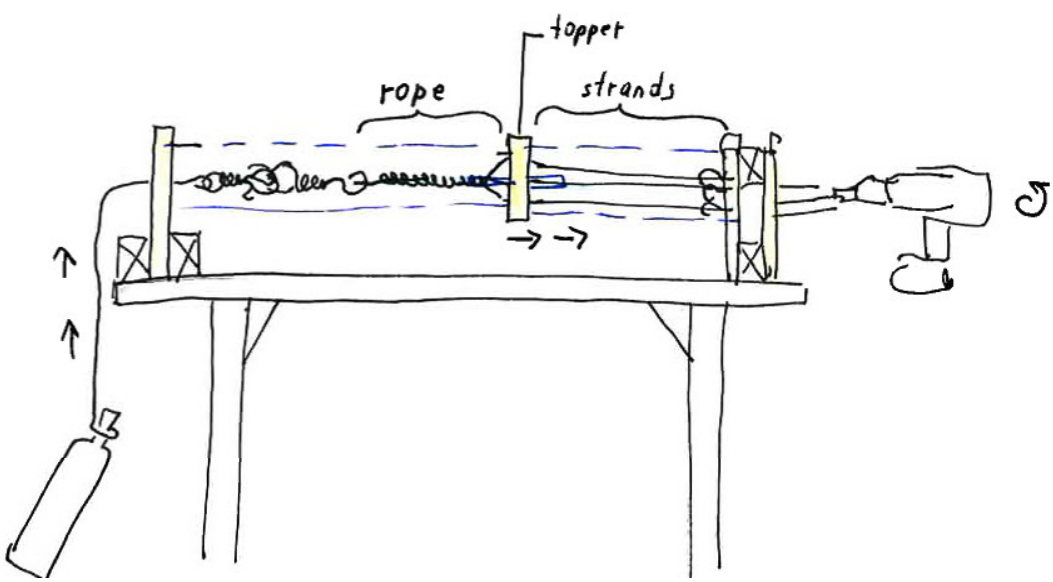
Sketch 3. The support block



Sketch 4. The topper

rope (or a cord) is pulled to prevent the material from tearing apart, whereas the two swivel hooks allow the rope to spin freely.

5. A ropemaker's topper is made from a small board. Five holes are cut out; three of them are for putting the fabric strips through, and the rest of it is for cords and straws that hold the topper itself and serve as a track. Topper automatically glides through the cords towards the spinner block if there is enough tension and pulls the counterweight at the same time while allowing the strands to twist into a rope.



Sketch 5.

TESTS

THE 1ST TRY

Unfortunately, the first attempt to make a rope is unsuccessful as fabrics tear apart and ends in a short length of 30 cm. The reason behind this failure is a lightweight counterweight that makes strands to overtwist and break.

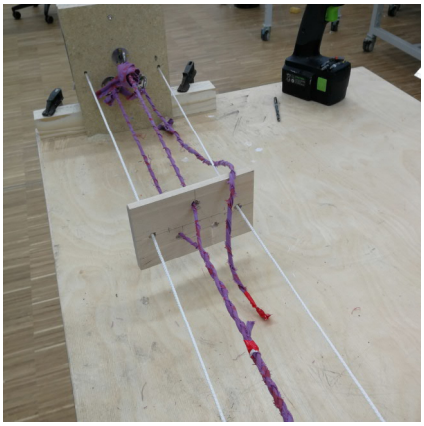
THE 2ND TRY

More water is filled into the bottle to make it heavier, and the distance between the spinner and traveller block is extended. The length of the rope this time is 62cm.

THE 3RD TRY

More problems occur during the third test. Although the topper seems to glide on the cords when enough tension occurs, it does not maintain a balance and flips over instead. Thus, it needs hand support or a total change of design. Another issue lies in the spinners, as they do not turn evenly. Unfortunately, the spinner that has a drill jaw attached turns faster than the other two. It implies that some strands also twist more than the others, resulting in the uneven lay of the rope. Tightening up the belt that keeps all the pulleys together might solve this issue, but it may reoccur as the rubber band is flexible and wears out through the time. Besides, tightening up the belt means shortening and resewing the belt all over again, which is not efficient in terms of time and labour.

A bottle counterweight



Fabrics tear apart

1st test

2nd test

3rd test

4th test

THE 4TH TRY

Tightening up the belt and the nuts in the whole mechanism solves the previous issue for the moment. However, the problem with the topper remains as it needs a manual pull, which means one more person is needed in the process. A final rope of 230cm is made.

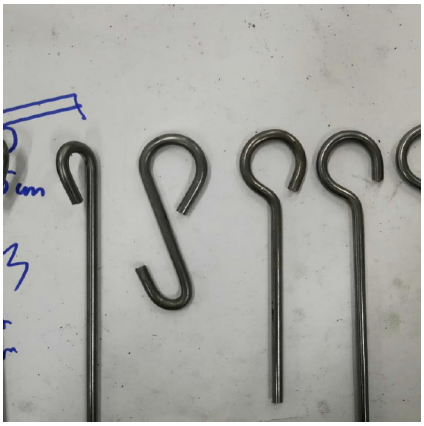
CONCLUSION

A progress emerges throughout the tests. It approves the idea of making textile ropes as the system works well enough to obtain tangible and good quality results. However, there are drawbacks of the machine that needs an improvement.

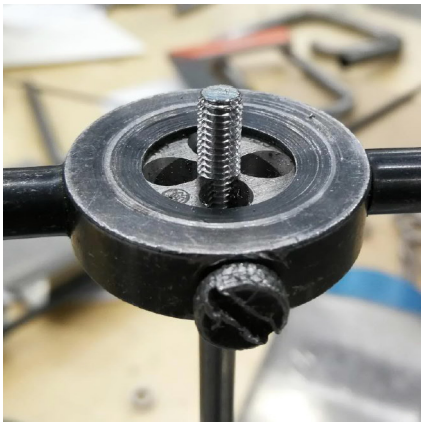
The topper does not move smoothly and needs a manual pull. Twisting speed cannot be readjusted as it depends only on the spinning speed of the drill. Also, the machine cannot be placed anywhere as it needs a certain space with surfaces to be clamped on.

Another problem lies in the belt drive mechanism as spinners very often turn unevenly determining uneven lay of the rope (the spinner with a drill attached will spin faster than the rest). Due to that the belt always requires tightening and different parts need to be reassembled.

So, a free-standing machine that would have a spinner-driver separated from the pulleys needs to be built.



Bending of eyebolts



Eyebolts threading

Inner bicycle tire

Castor wheels

MOCK-UP 2.

A FREE-STANDING MACHINE

At this stage, a free-standing machine is built to be used anywhere regardless of space and equipment. A belt-driven system that is similar to the previous experiment is combined with some smaller improvements.

The spinning mechanism is essential and the most challenging part of the machine. Plastic wheels from the previous experiment are changed into wooden pulleys, as such material is easy to work with and should go well with the belt. The spinning block consists of the driver pulley (to which the drill or the handle is attached to prevent from uneven twist), three driven pulleys, and two extra pulleys and the belt looping all over them.

MATERIALS:

WOOD

- Driven pulley :

Ø 30 mm, 15-16 mm wide groove (belt is around 15 mm width)

Ø 5mm central hole

- The driver pulley :

Ø 120 mm

15-16 mm width groove

A central hole is decided according to the axis in a later stage

- Supporting plywood board:

1100 x 200 mm + plus beams from the sides.

BOLTS

- Left from the previous experiment.

BELT

- A Generator flat belt, 15 mm wide; 700 mm long
- A Rubberband from sports

THE PROCESS

ASSEMBLING

Holes according to the position of the pulleys are made in a new board. Smaller pulleys are fixed to the axles with washers and nuts while the driver pulley needs a different method because of its big-

ger size and weight. A sort of collar flange bolt is welded for such a purpose. A square hole is cut out in the pulley centre, and the bolt is mounted to the pulley tightly.

Without further development, a few tests are run to check if such a mechanism works at all.

Unfortunately, the trial shows negative results. The first experiment is conducted using a rubber band, that turns the pulleys very slowly, and there is not enough of a tension. Another try with a generator belt does not work at all. It is due to much of the friction between the wood pulleys and belt. After conducting more tests, both belts start slipping off the pulleys more often. Paradox, the rubber band from the bicycle tire, works better than the other two straps but it is insufficient as the mechanism does not do its job.

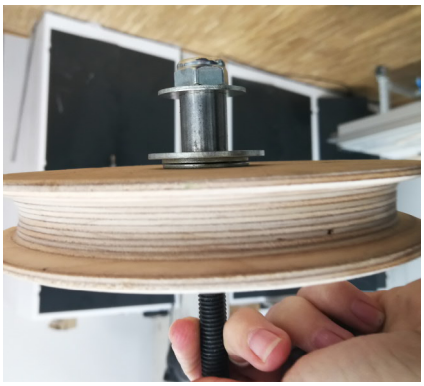
CONCLUSION

A failure with the current mock-up requires a revision of the design of the mechanism. First, the locking system of pulleys to their axles seems technically incorrect while wood appears to be unsuitable material for the pulleys. Then, there is not enough force coming from the 'driver' to spin the rest of the pulleys. The spinning energy seems to decrease due to an intense grip between the pulleys and the belt, while it should be more smooth and slick.

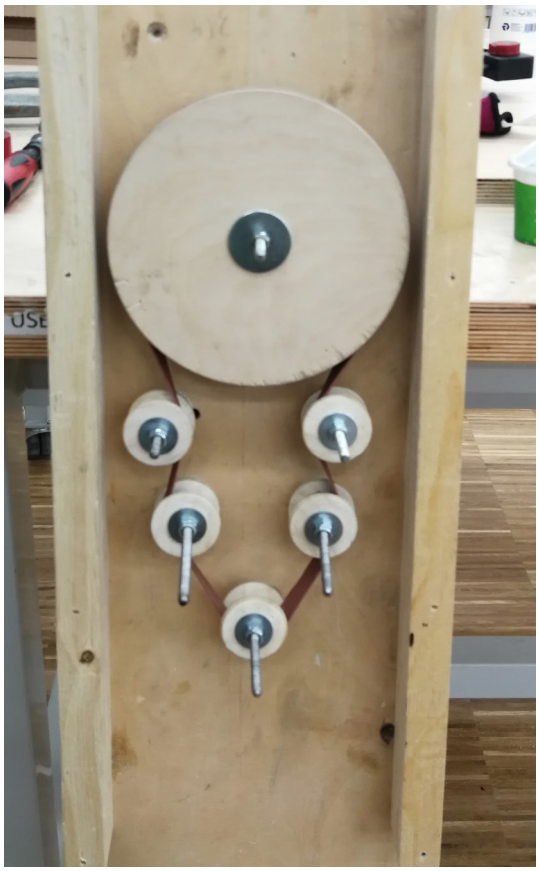
Therefore, there is an option to remake the pulleys from a different material and repeat the trial. Steel and plastic-based materials would probably work, but it may require advanced machines and skills which is hardly compatible with simplified DIY and open-source idea

of the thesis. On the other hand, there is a big chance that the system and the positioning of the pulleys are already wrong, and modified materials will not solve the issue. To conclude, a belt-driven mechanism is not reliable at this point.

A collar bolt for the driver pulley



A driver pulley



A spinning system

MIKKO SNELLMAN

The whole making process has been based on learning by doing. After completing two not-quite-successful mock-ups of belt-operated mechanisms, I felt very lost and decided to reach out to others' people knowledge.

Mikko Snellman, based in Köyliö, Finland, is one of few persons worldwide running a manual rope-making business. His business includes cordage making, workshops and rope artefacts. He is also a member of International Guild of Knot Tyers.

We met at Kotka's marine festival in 2019 where he was selling his artefacts and inviting visitors to try out rope making. My goal was to get acquainted with the craftsman and receive some advice on a rope and machine production.

Rope making is almost natural to Mikko as he has been surrounded by the maritime environment from his early childhood. His machine is

a replica of a traditional hand-driven rope making machine which uses a gear system. With this device, he provides people with high-quality cords all over the world, and there is a high demand for it as he stated.

During the event, I had a chance to run a trial of rope making with the traditional machine. Mikko has also commented on the ropes that I made with the mock up1 saying that the lay was uneven. So, it was the right moment to receive useful tips and witness how things work in practice.

Manual rope making seems to be more like a museum or entertaining activity that is met among a few passionate individuals such as Mikko Snellman across the world. Since rope making is so rare to see in daily life I feel even more honoured to have had the opportunity to meet such an experienced rope maker.

Mikko Snellman and me, Kotka maritime festival, 2019. Photo: Jani Vahto

MOCK-UP 3.

MAJOR CHANGES IN DESIGN

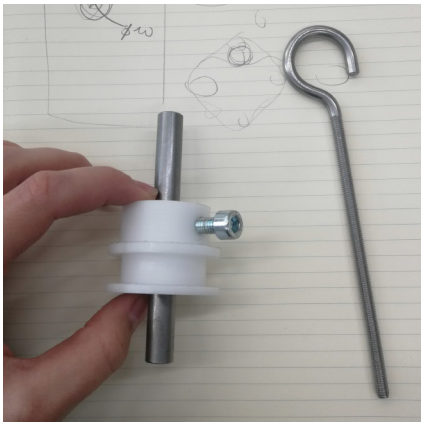
After meeting a rope maker Mikko Snellman who works with the traditional machine that is operated with gears I decide to experiment with a similar and more simplified mechanism for the mock-up 3.

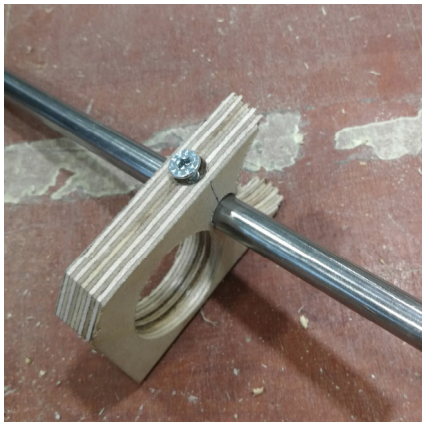
However, before diving into making, we need to find a way of locking gear to its shaft so that both parts can be disassembled if needed.

Janne Ojala, a master of Mechatronics at Aalto University, shares a tip of screw locking systems in mechanical engineering. A few variations are tried out on nylon and plywood, and a sleeve-like locking system with the screw seems to work (photo on the opposite page). It means that a new machine can be built.

A FINAL ROPE MAKING MACHINE

Final work is a combination of attended public workshops (observations), learnings from rope history and failures during the experimentation with mock-ups. The concept of the final work lies between an





A screw locking system on nylon and plywood

open-source idea and engagement with the public. Making a rope is very involving, and depiction of such a process is significant. Rope making with a machine is a way to show that upcycling textiles can be fun and meaningful. Production of the machine needs to be simple as the instructions of it could be shared in the future. Accordingly, the mock-up 3 carries out only the main functions that are presented in the following chapter. Since previous experiments that sought to create an automated machine have failed, instead, a traditional gear system is chosen for the final rope making machine.

GUIDELINES & PRINCIPLES FOR THE MACHINE:

- attractive - modern
- hand-driven
- a small storage for fabrics
- safe to use in public
- possible to build for others
- disassembled parts - easy for traveling

MATERIALS & COMPONENTS:

TEXTILE MATERIALS

Textiles that are used for experiments are the mixture of post and pre-consumer waste from the fashion department, at Aalto University, recycling factories, second-hand stores and own closet.

METAL PARTS

- Eyebolts: Ø 5mm x 3 pcs. (the same production process is repeated as in the mock-up 1)
- Bolt: Ø 10mm x 1 pc (for a big gear and a handle)
- A collar-sleeve for the eyebolts: outside Ø10mm; a threaded hole of Ø 5mm; made from a steel rod.
- DIY bearings: Outer Ø 18mm and a hole of Ø10mm, L ~100 mm; can be shortened according to the final structure; 11 pcs. (Bearings are inserted to the wood board so that the axles would move smoothly).

WOOD PARTS: GEARS

Gears of a ratio 3:1 are designed. A gear system contains three smaller and one bigger gear which will have a handle mounted on it. Gears are made in reference to recommendations at Capolight Electronics Projects website (2015).There are two crucial things taken into consideration - a pressure angle and pitch radius:

- A pressure angle affects the geometry of teeth and is recommended to be 20; the same number stays in every gear.
- A pitch radius is a distance from the centre to the pitch point – a

contact point where gears meet. A chosen pitch radius determines an approximate size of the gear. Thus smaller gears at this point have 20mm while the driver gear has 60mm of pitch radius following the ratio of 3:1.

SUMMARY:

- Ratio 3:1
- Pressure angle: 20
- Teeth:

Small gear 12

Bigg gear 36 (3 times more according to the ratio)

- The pitch radio:

Small gear 20mm

Bigg gear 60mm

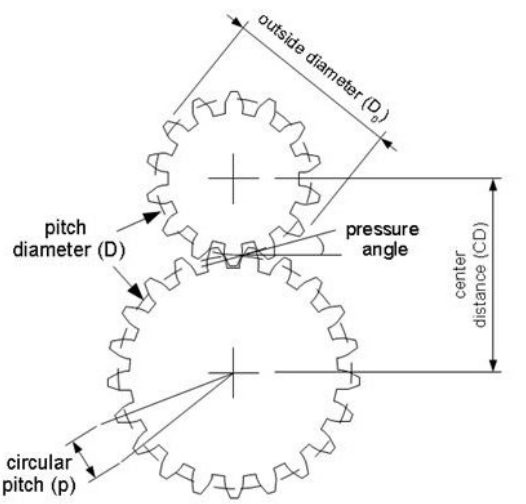


fig 14 Explanation of the gear design

THE PROCESS

GEAR BLOCKS

Gears are cut from 9 mm plywood by CNC machine. Then the sleeves/collars where the lock is placed are made from ~15 mm plywood. Gears and collars are glued together, forming a solid block. Everything is checked by inserting a bolt into the block and locking all elements together by a screw. After checking the system, the rest of the machine parts are made.

PART 1. A DRIVER BLOCK

As mentioned earlier, a driver block or jack is the essential piece of the machine. It is a part where gears are placed, and twisting of each yarn or strap into strands begins.

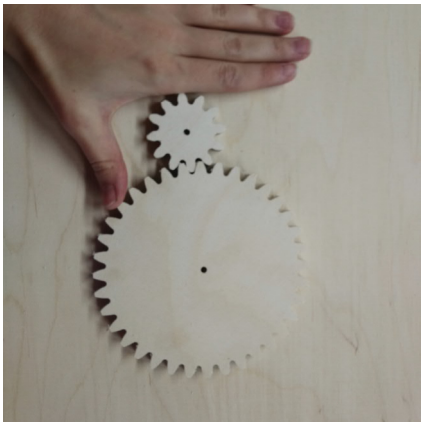
1. Plywood planks are cut – 10 mm thick, 350 x 250 mm size, 2pcs.

2. The gears are positioned, and the holes are marked and drilled through the plywood boards. The size of the holes is equal to the size of the bearings.

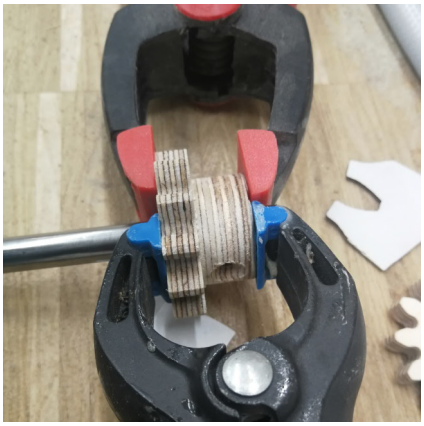
3. The bearings are inserted to the board by using a hammer.

4. All elements are mounted together according to the sketch (6) leaving a gap of 30mm between the boards (24 mm gears + 2 washers of around 2-3mm in total).

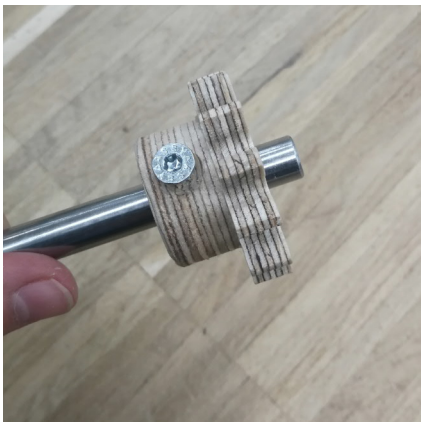
5. The rest of the frame that supports the boards is designed. Supportive legs are made from solid pine wood, and all components are



A driver gear and driven gear



Glueing of gear parts



A screw locking system

Preparation of bolts

Positioning of the gears

Bearings in the board

fastened using barrel nuts and socket screws so that the piece could be taken apart for travelling or moving.

6. When legs are ready, the boards are mounted on top and joined by bolts and cap nuts.

7. A handle is needed to turn the driver gear. It is made from an L-shaped rod, a steel collar with a hole for the lock screw and a wooden cylinder for a soft grip. Steel rod and a collar are welded into one unit and attached to the bolt of the gear by the lock screw. (sketch 8)

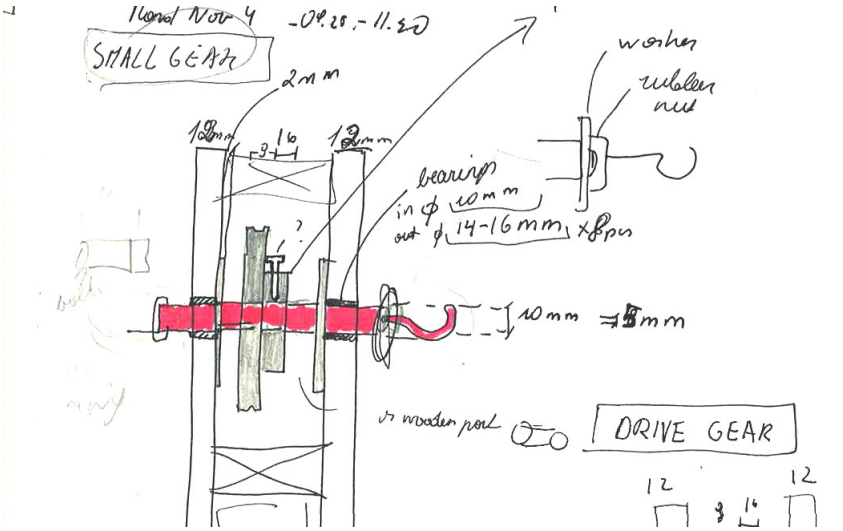
PART 2. A CARRIAGE

A carriage, known as a traveller, is a part that automatically moves towards a driver unit due to the contraction that occurs during the strands twist.

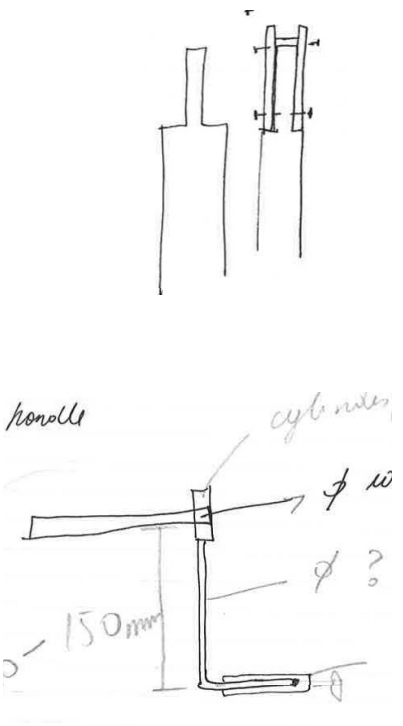
1. The design consists of a triangular base that has two wheels in front and a vertical beam with a hook on the front top. Wheels make the movement smooth, whereas the hook lays the strands together into a rope.

2. A triangular base serves for placing a basket-box that stores fabrics and ropes during and after the process. Clear acrylic is chosen to produce the box so that the contents of the box would be visible and engaging with the audience. The box of 350 mm x 350 mm x 250 mm(h) is built after acrylic sheets are cut by laser and carefully glued.

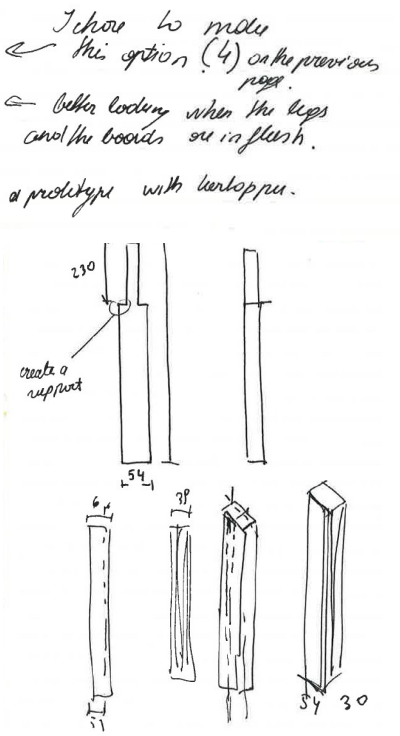
PART 3. Following the same concept of transparency, plywood boards on the driver part are changed into acrylic. It creates a modern look and helps people understand how the whole mechanism works as the gears become visible too.



Sketch 6. Arrangement of the elements in the spinner block



Sketch 8. A handle sketch



Sketch 7. A sketch of supporting legs

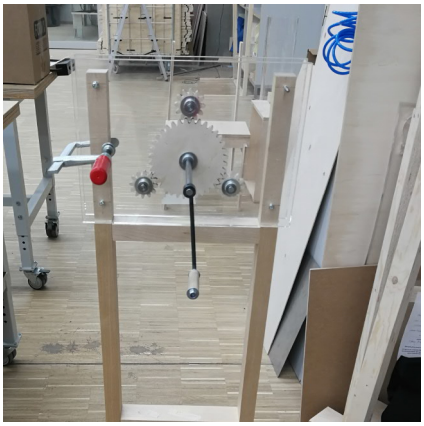
TOPPER

A topper, also known as a spreader, prevents strands from interlace. After a few tries of making traditional wooden toppers, a path of modern version is picked as the acrylic topper is cut with the laser to follow the transparency concept.

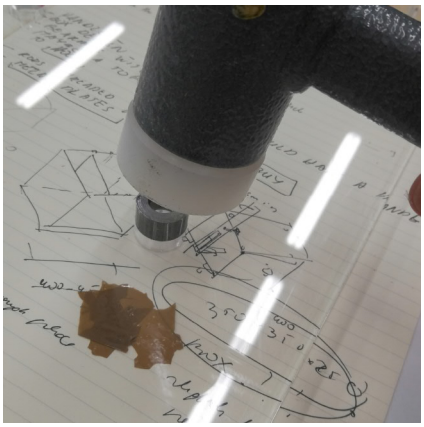
TEST

After finishing the construction of the machine, a few trials are run. As a result, some things of the ‘traveller’ (carriage) change as its hook does not rotate during a rope contraction. A quick improvement is brought through making a new handle for a carriage. From now on this hook is turned manually by hand and the process of a long rope making always require two people at least.

A plywood board

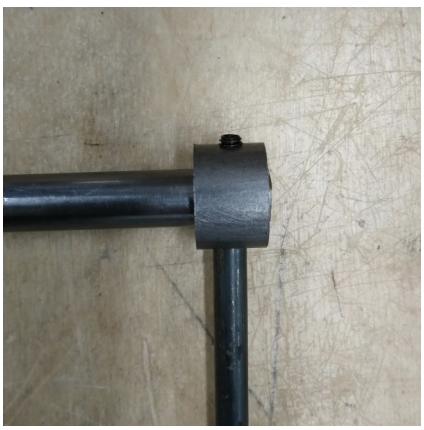


An acrylic board



Bearings in the acrylic board

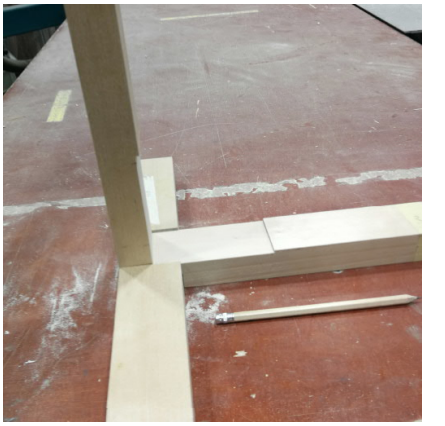
Disassembled handle



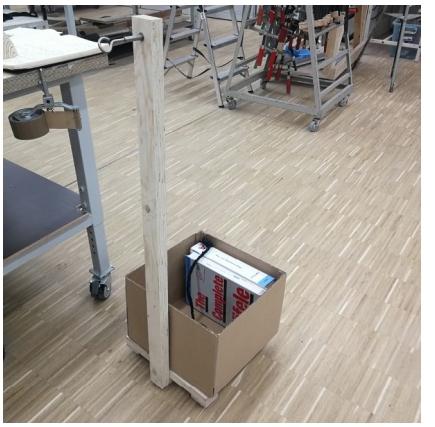
A handle assembly

A handle assembly

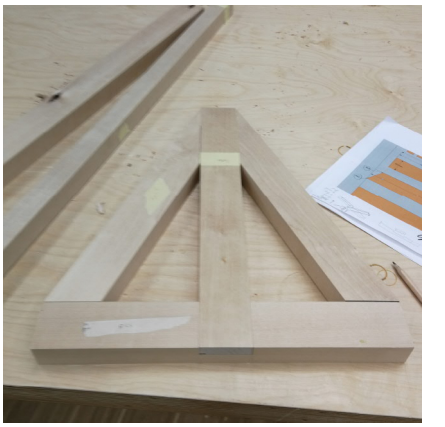
Assembly of the base



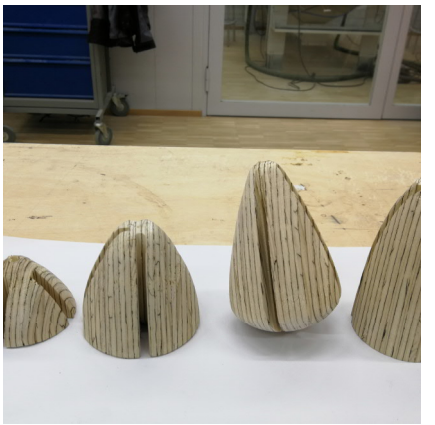
Assembly of the base



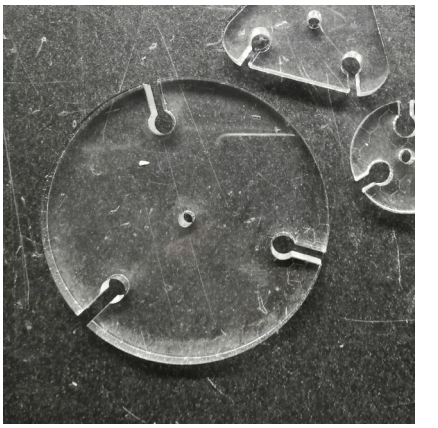
A basket for storage



The base for the basket and carriage



Traditional toppers



A modern topper

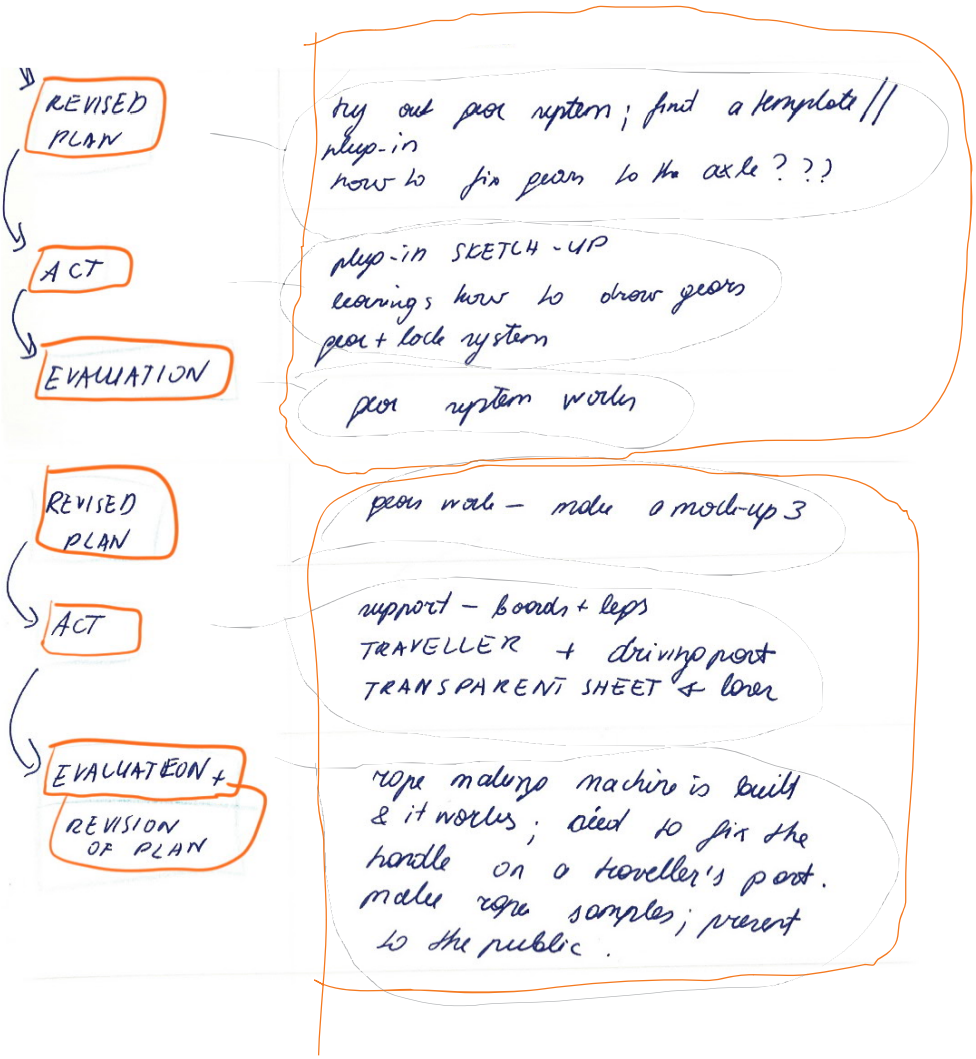
MOCK-UP 1

MOCK-UP 2

MIKKO SNELLMAN

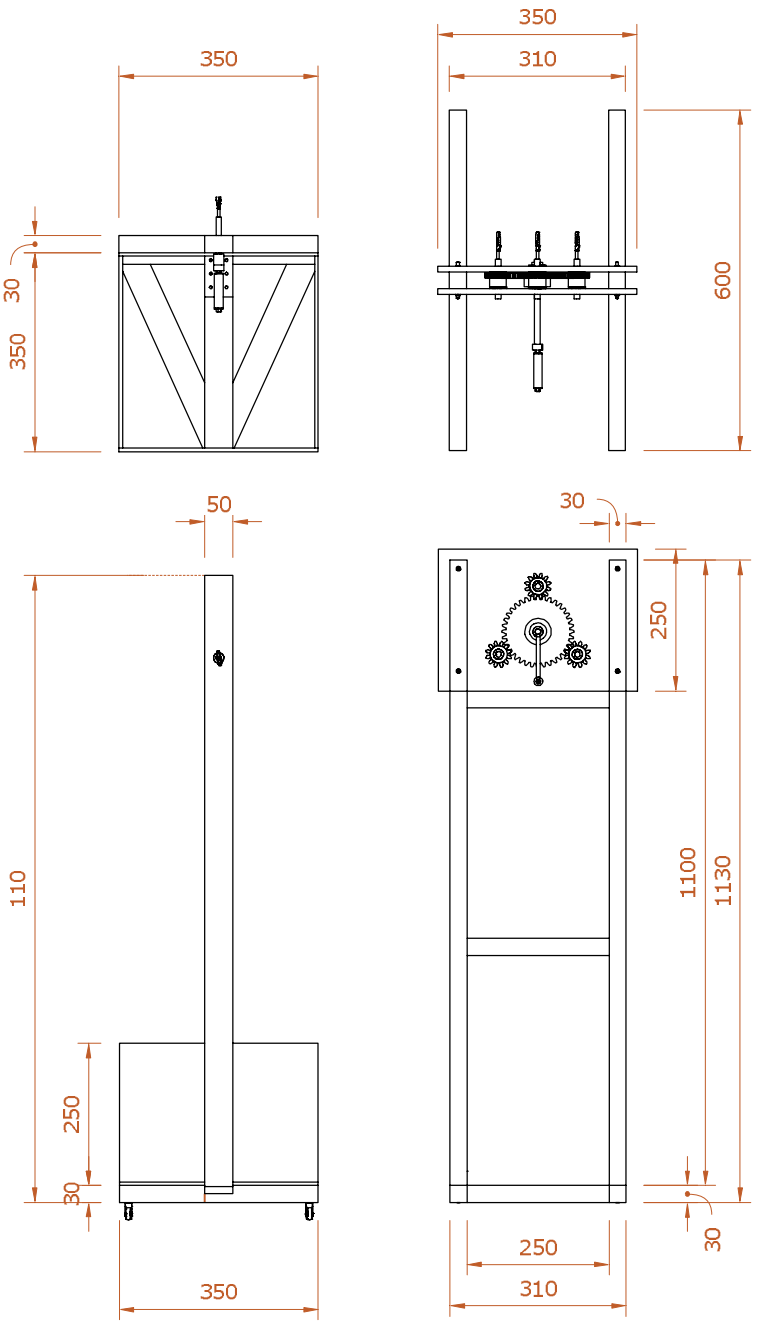
Design part according to action research

MOCK-UP 3



Design part according to action research

DRAWINGS & PHOTOS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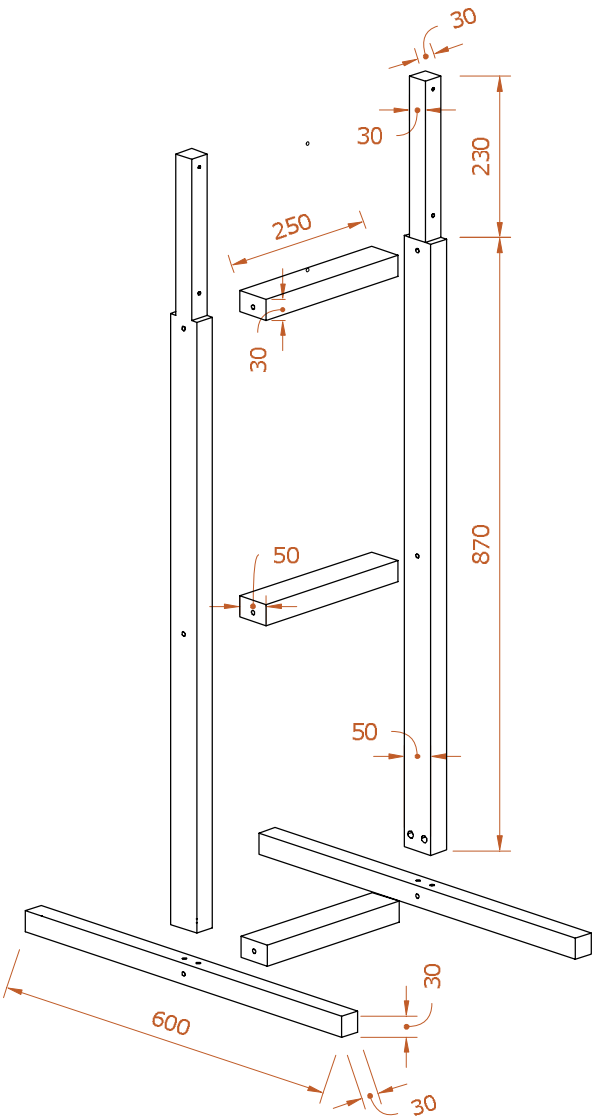
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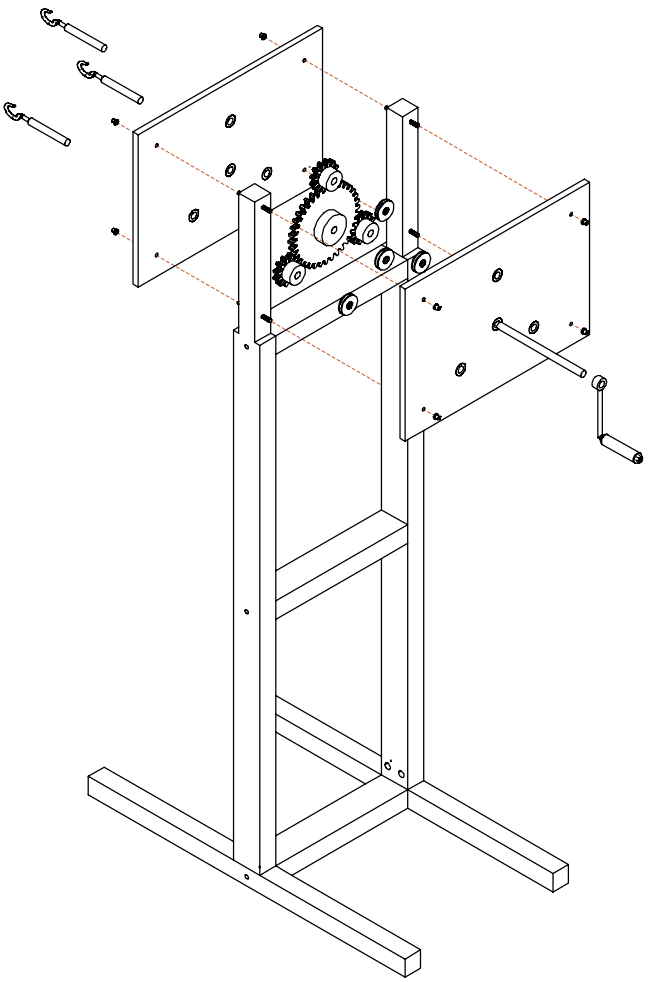
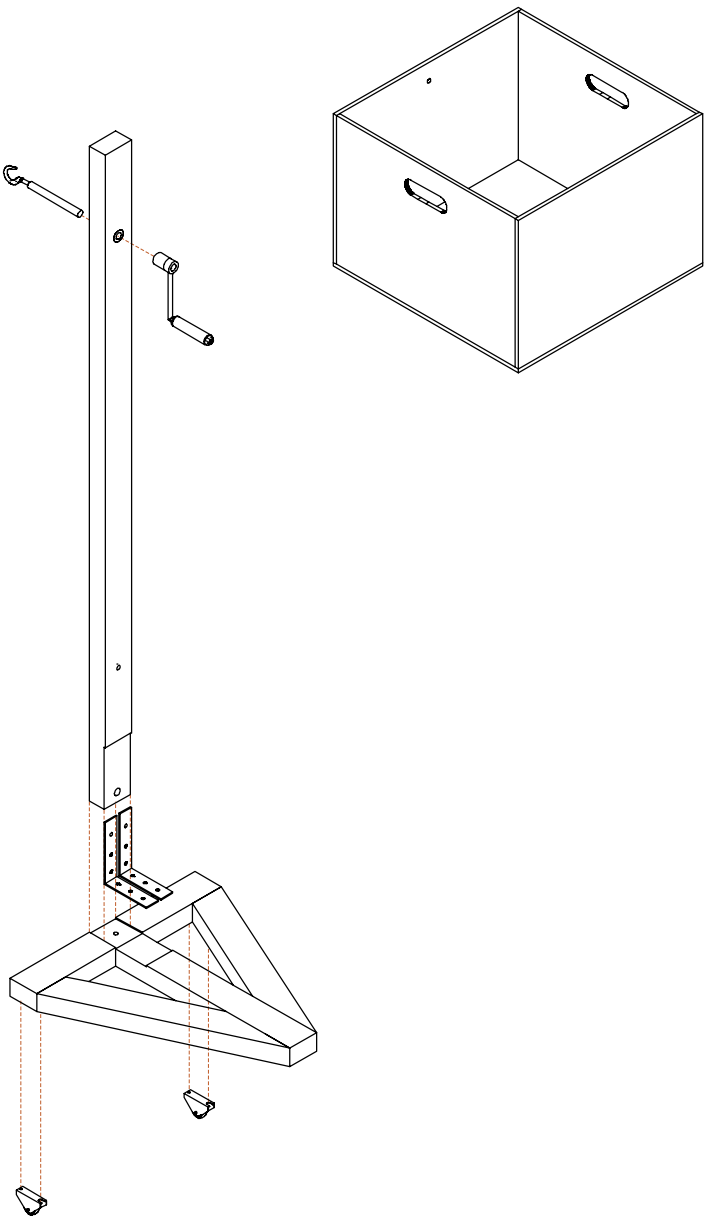
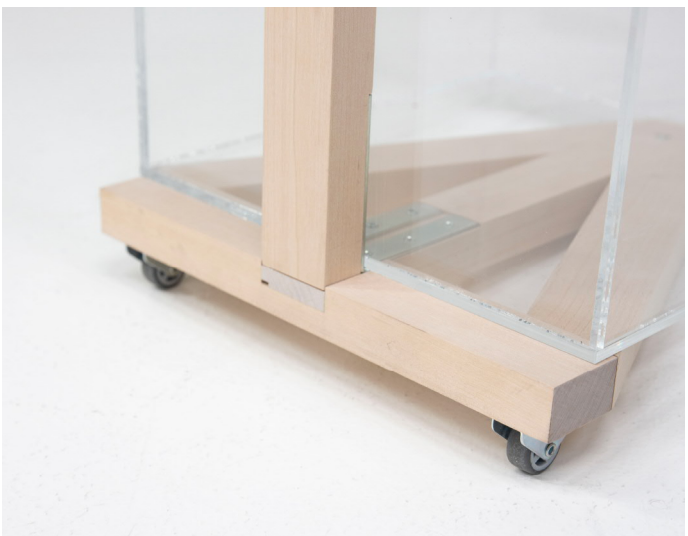


A driver block

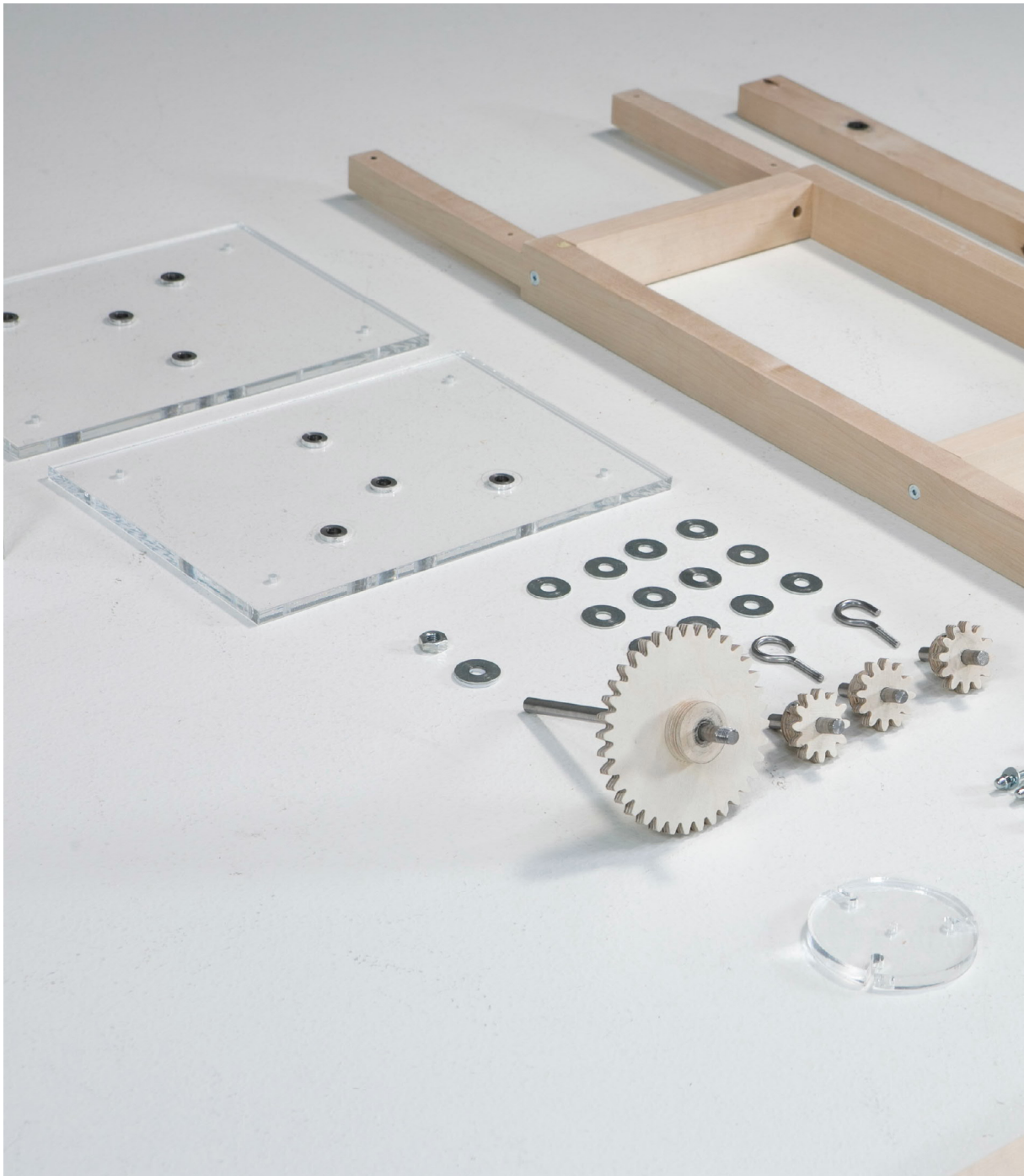


A traveller (carriage)

A driver block



A traveller (carriage) block



Disassembled machine

SHARING KNOWLEDGE WITH SOCIETY

PUBLIC EVENTS

In order to have a more significant impact one needs to go public with one's ideas; therefore, sharing Upcycling Textiles project with people outside the academic field is a vital part of the thesis. Introduction to society is implemented in two parts. The first part involves a participation in the workshop and public event of Helsinki Design Week 2020; the other part is to use digital platforms and channels to share the instructions of the machine and the whole concept of the project.

UPCYCLING WORKSHOP

2020 WARDROBE GOALS is a workshop - seminar organised by the wardrobe management app "Lagoom". It is a recently released app that connects people who want to sell or swap their closet items and keen on sustainable fashion.

The topic of the thesis fits perfectly with the seminar's theme; there-

fore Up-cycling Textiles gets involved in the event. In the beginning, organisers present the ways how to organise the wardrobe and avoid spontaneous shopping. Then a short introduction of the thesis project begins and guests are invited to try the hand-driven machine.

Participants choose from various fabrics they want to combine, and then the process of rope making takes off with two volunteers and me. The procedure is as usual: when fabric strands turn into around 45 degrees angle, they are then intertwined together, forming a final rope. In the end, the rope is detached from the machine and stretched. The first attempt is not as smooth as pulling on one of the strands breaks; it only shows the true nature of upcycling.

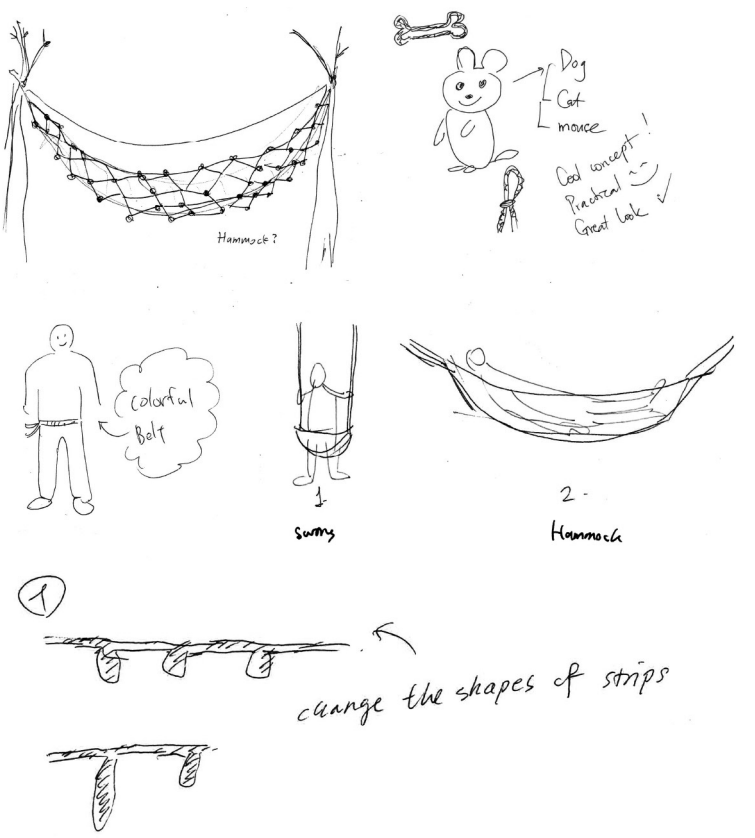
Nonetheless, the process continues without any unexpectedness, and more volunteers try out the machine. The workshop speeds and piles up with more upcycled fabric ropes.

REFLECTIONS

I am very glad that the project caused many discussions about textiles, fashion and upcycling itself during and after the workshop. Hence, participants were able to leave their feedback about the work. Some of them suggested different applications of ropes such as fashion accessories, swings, hammock; others were more likely to express their feelings about the project and ideas for future workshops. One of the participants noted that making a rope felt very relaxing after a long working day; she also expressed the gratitude that the machine involves two people so the conversations emerge. Some people also saw the project as a community activity that could be led by some common goal to turn old items into something of a higher value that people and sustainability could contribute from.

What is more, many of participants did not know how ropes are made and were surprised by such an unexpected approach to unwanted textiles. In the end, it's pleasant to see that the topic continues to be relevant and touching people's mind.

Participants are mainly very young between 25-35 years old, many of them are students



Sketches made by the participants (scanned images)

Upcycling Workshop. Photos: Viktorija Piauliokaite

HDW 2020

Upcycling Textiles has become a part of Helsinki Design Week 2020. The thesis project, together with other works, is exhibited in the main exhibition at the Helsinki Olympic Stadium. The theme of this year's Design Week is sustainability and commitment, so the exhibits are rather novelties, concepts, creative installations rather than polished objects and projects (HDW, 2020). Therefore, Upcycling Textiles is very suitable in this context.

The booth of Upcycling Textiles consists of a rope making machine and rope samples. The display is also complemented by a showcase of video material to give people a clearer picture of the concept.

REFLECTIONS

Although the event was not meant to deliver the final products, I still felt that many of the prototypes in the exhibition were product-based and had to be mass-produced one day. Thus, I felt that Upcycling Textiles was different from the other projects as it did not focus on the product that much. On one hand, it made me feel like a pioneer, especially when talking to people about sensitive issues of textile waste, consumption and up-cycling; on the other hand, I also wanted to blend in with the exhibition environment and be more comfortable. The reason behind this feeling was a desire to be likeable and understood. Visually pleasing objects are usually easy to perceive and admire than the project of Up-cycling Textiles that may require more effort and context to understand.

Despite these internal insecurities, the exhibition went great and received a great deal of attention. In my opinion, one of the key points of such success is the interaction caused by the rope making process, as many

people wanted to test the machine themselves instead of only looking at it. To my surprise, only few visitors were familiar with the production of ropes, and usually these people were older. Majority of visitors experienced the production of ropes for the very first time and felt impressed by the machine and the project itself. Those who are familiar with rope making were a little more critical of the project as they did not see that I was doing anything new, although they still found the use of old fabrics intriguing and great for bringing back old knowledge of rope making technique.

It was easy to start a dialogue with people and observe their attitude while doing ropes. I received a lot of feedback: from suggestions of what could be added to the machine, to references of Finnish rag rugs and advice to participate in Iceland's Design Festival. Those who were passionate about crafts or textile design were very interested and wanted to know more about the fabrics and processes. Other people were very practical and product-oriented and wanted to hear only about specific rope products or the possible thickness and lengths. One of the questions I heard very often was whether I was selling ropes, as dog leashes were getting a lot of attention from visitors.

In addition, people shared their childhood memories by telling me how they made things by hand and learned the skills of reusing old clothes and household fabrics from their grandmothers. Another poetic insight was brought up by one of the event volunteers as she emphasized the power of the machine as it brings strangers together to collaborate in order to make a beautiful rope, which is especially rare in difficult COVID-19 times.

At the end of the three - day festival, I had a lot of short ropes made with the visitors. The only thing I could do differently was to have an extra showcase for these items. Using them for a larger installation during the exhibition would turn visitors into active participants and give the exhibition more meaning.

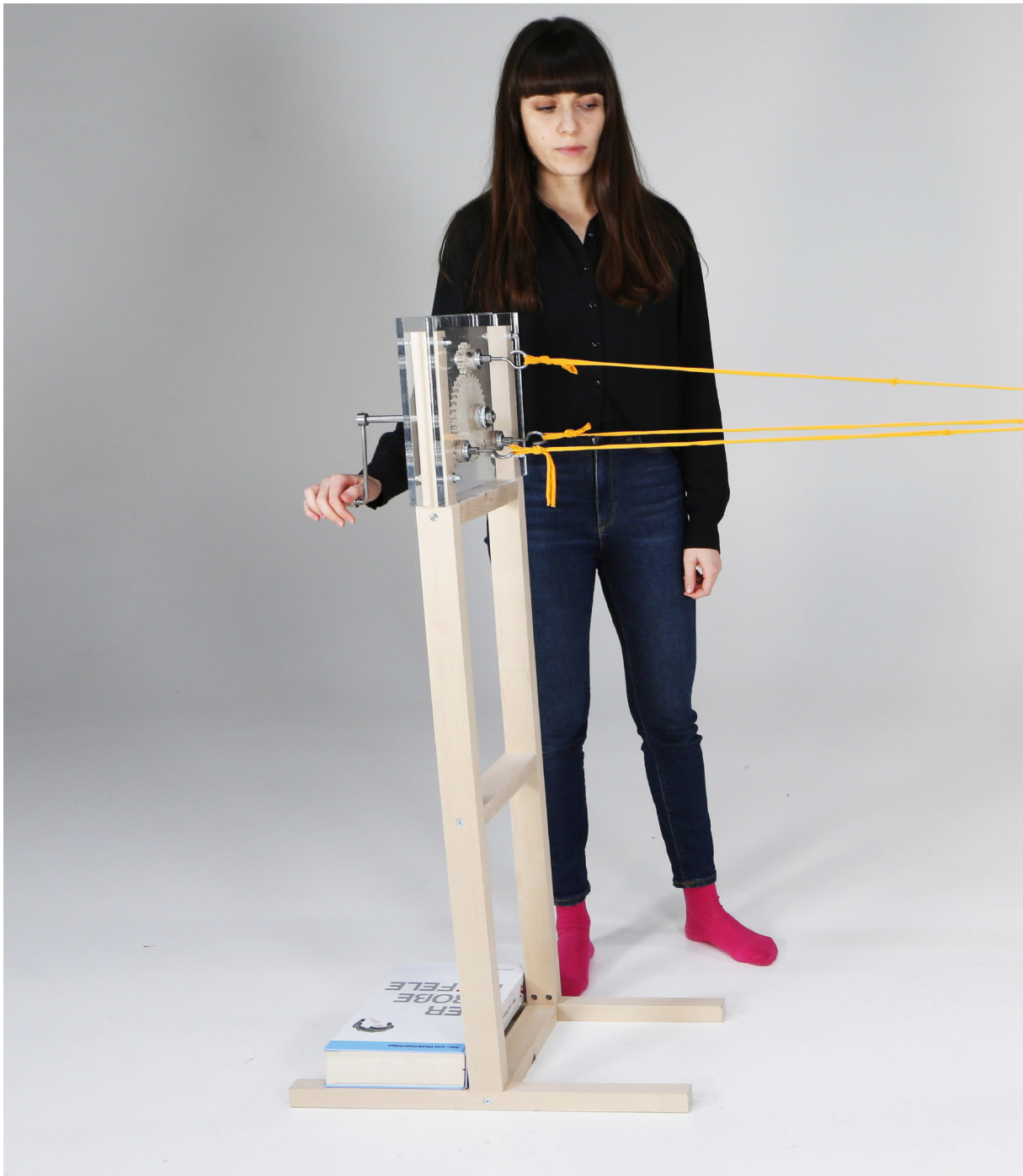
To conclude, I felt that people corresponded to the values of the project and expressed support. I noticed a lot of layers in a project that everyone can delve into and find what they like the most. It also inspired the continuation and development of the project in the future. As a by-product, I was able to make contacts and meet interesting artists and professionals.

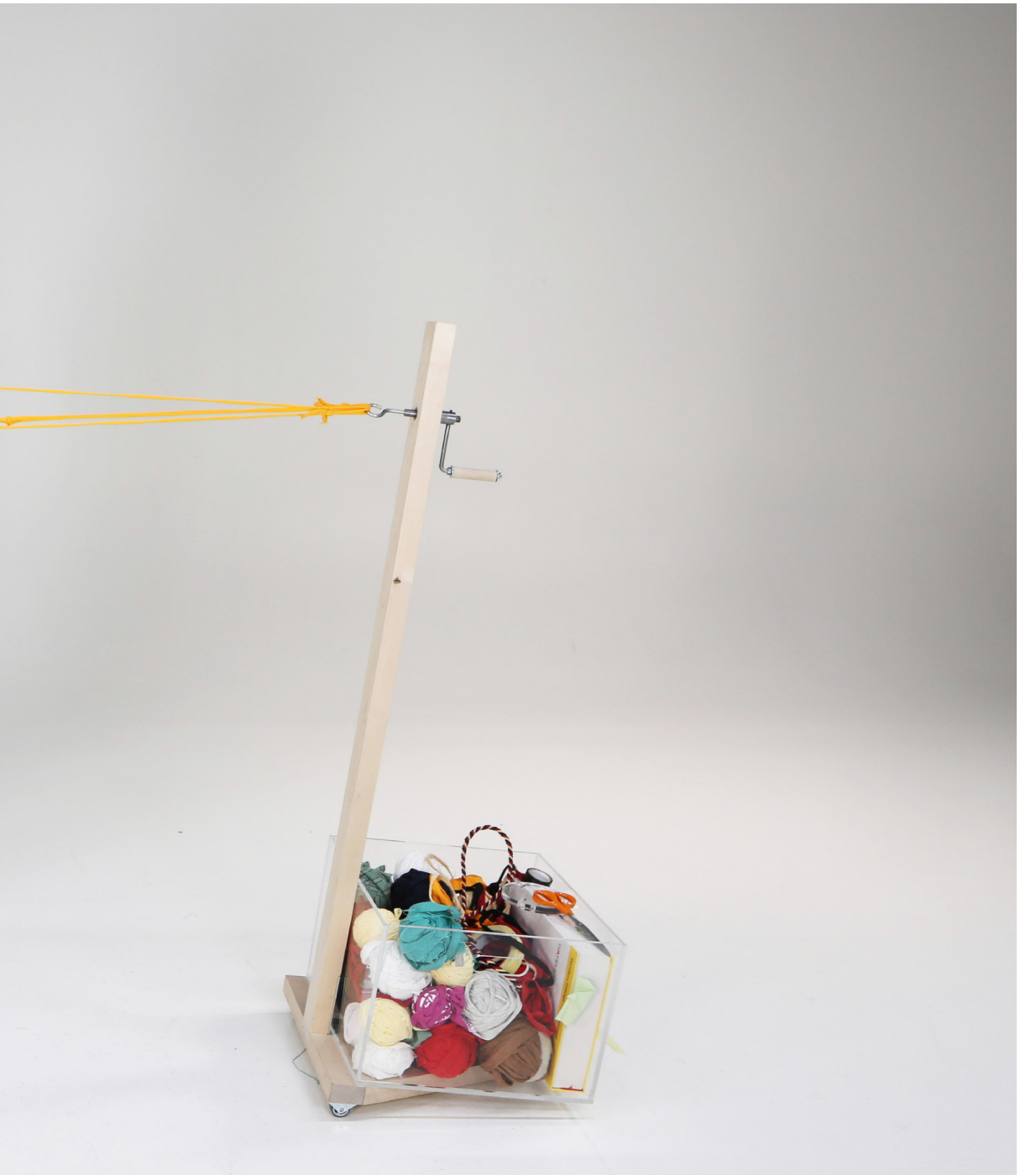
HDW 2020. Photo: Leon Laude

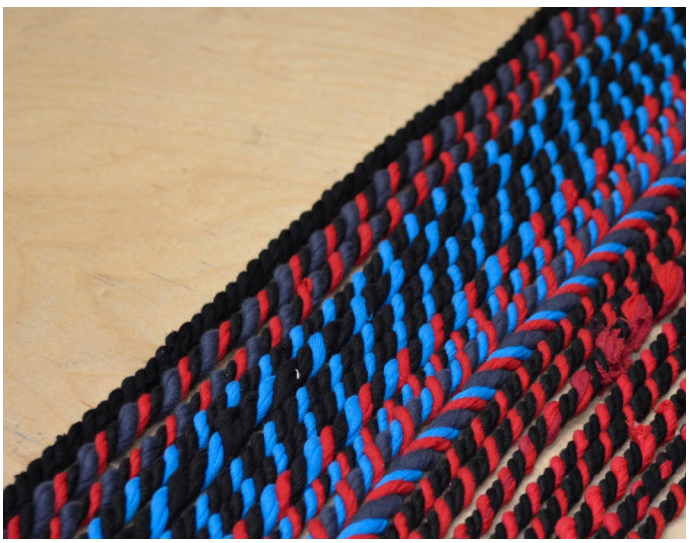
ROPE EXPERI-MENTS

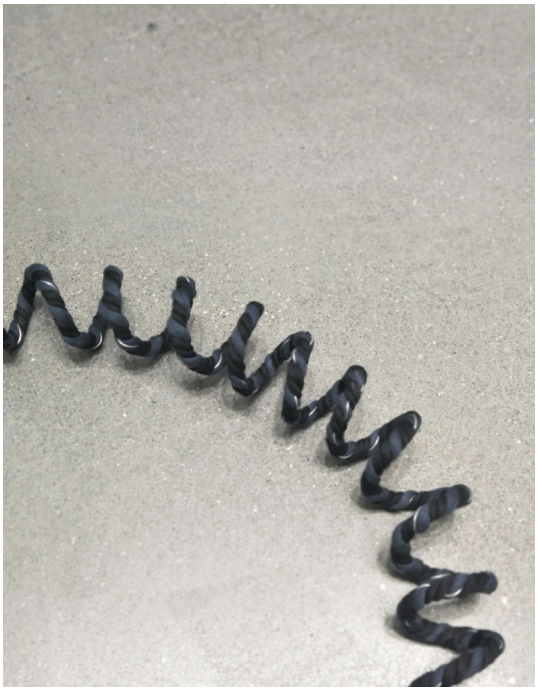
Photo: Saara Kantele

The process of making a continuous strip

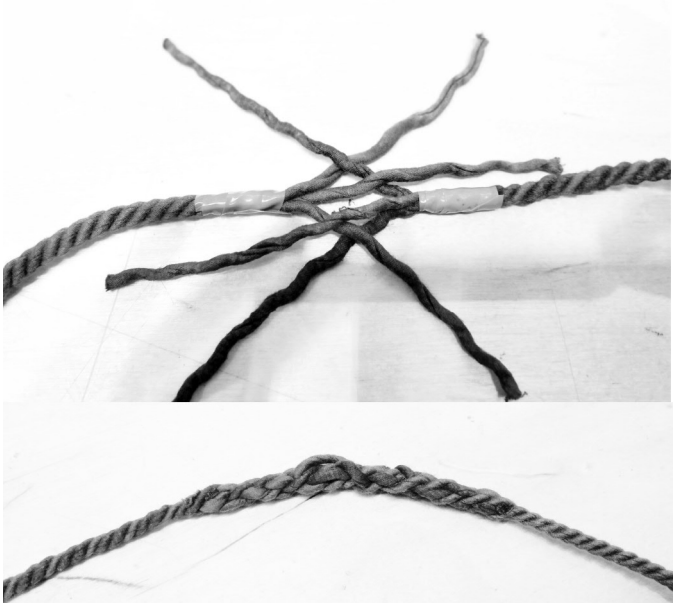






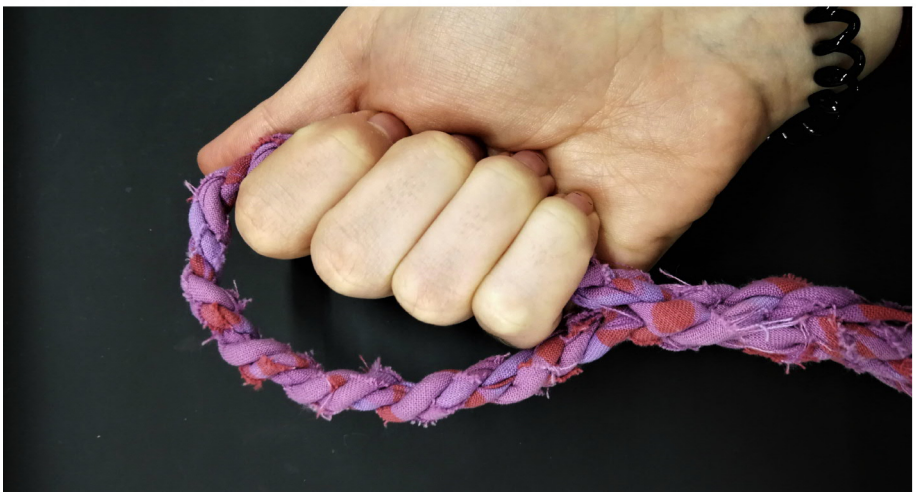


Experiment with fabrics and wire



Splicing - joining two ropes into one

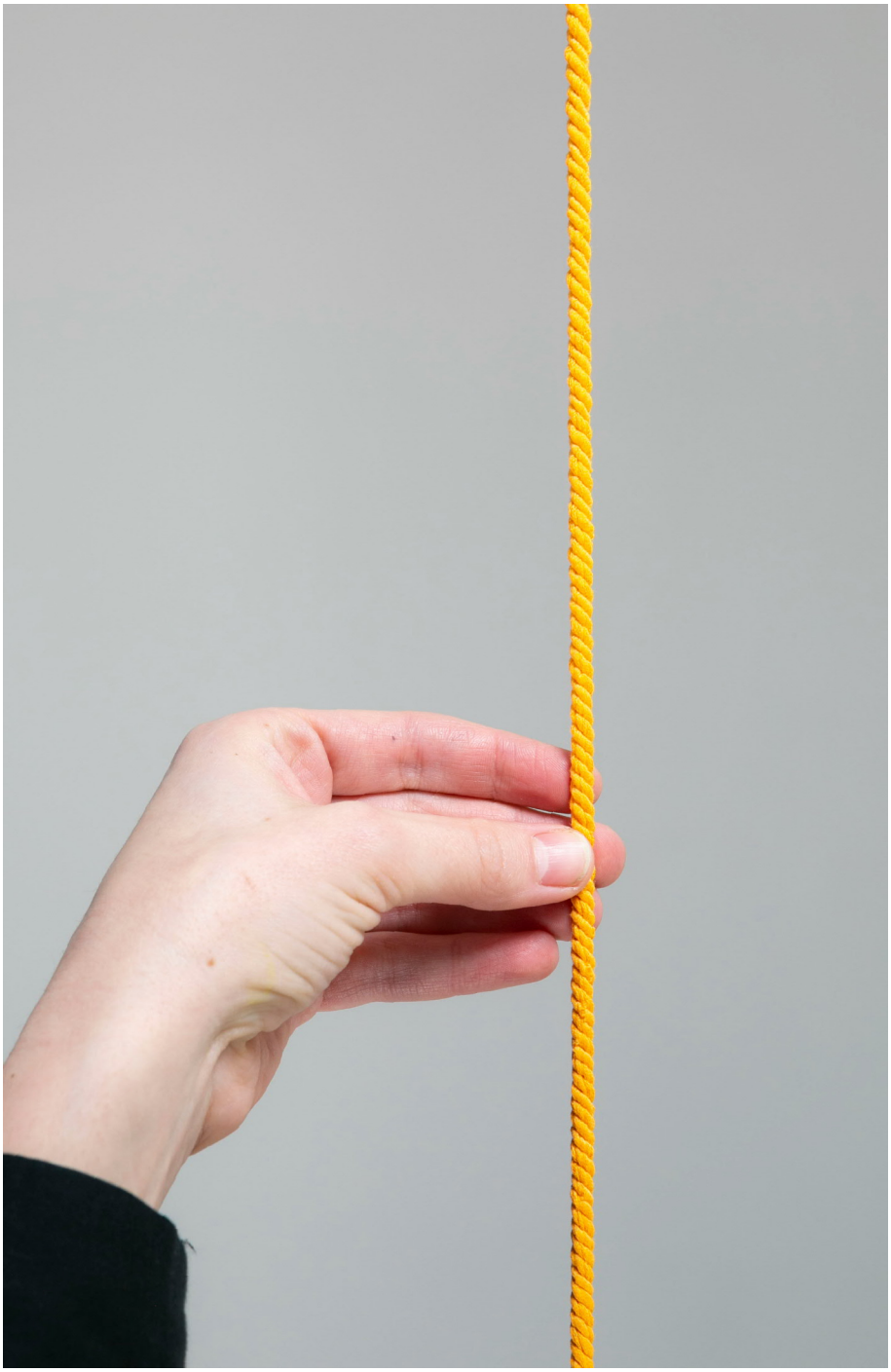
Checking the strength of the rope made with the hand-driven machine

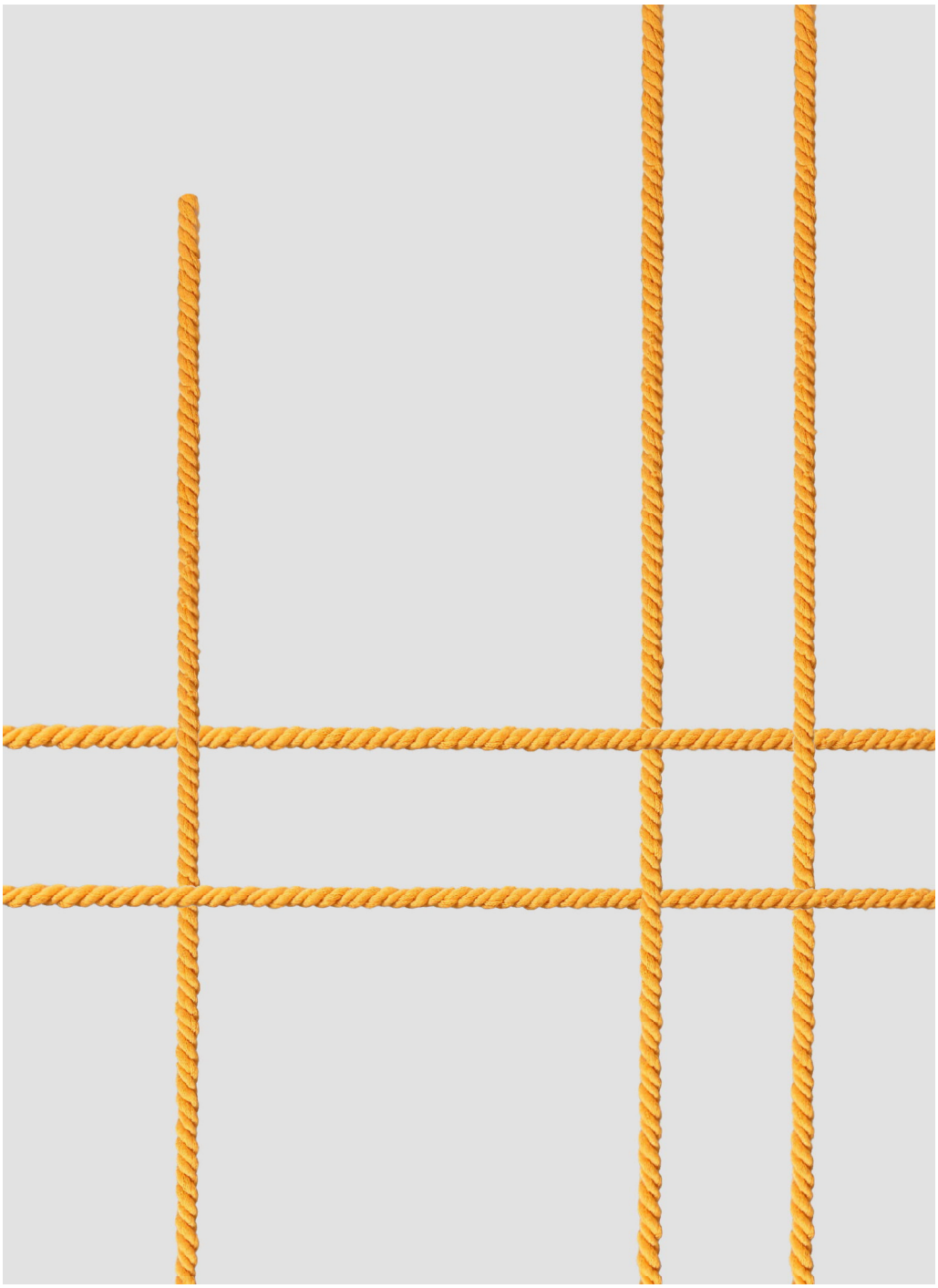


A dog leash and toy made of upcycled rope

Some applications: a plant holder and bracelets

A sample of knitting





CONCLUSION

CONCLUSION

This chapter summarises the project and evaluates the outcomes. Possible options for changes and implementations in the future are also presented. Personal reflections sum up the whole thesis at the end of the chapter.

Upcycling Textiles is an open-source project that focuses on utilising discarded textiles. A modern version of the hand-driven machine has been built to make textile ropes that are strong and functional. The main goal is to improve the process of textile reuse on a consumer level and to share this knowledge with society. The machine serves not only as a tool to make and demonstrate the process of upcycling but also works as a medium to teach and evoke conversations with people. The project has been shared in the public workshop organised by Lagoom and showed in the exhibition of Helsinki Design Week 2020.

PROJECT SUMMARY

RESEARCH SUMMARY

The theoretical and practical research helped to navigate the direction of the thesis. Information collected from a variety of sources, such as books, articles online, or documentaries has provided a broader understanding of upcycling and the scale of textile waste worldwide. The thesis is mainly influenced by attending events and workshops related to sustainability and community, the two factors that are also very significant in Upcycling Textiles.

DESIGN SUMMARY

Rope production has been chosen as the main way to upgrade unwanted textiles because of its aesthetic properties and strength, which can withstand more weight than normal end-of-life textiles. Plus, the options to combine different colours and patterns are endless and that gives freedom for design variations.

The design phase is based on action research. A total of three mock-ups are built, of which only the last one serves the project. Because of limited time and the first two devices that failed, a more traditional mechanism of gears is chosen for the final rope making machine (mock-up 3). It consists of the driver block, a carriage with a small storage for fabrics and a topper. The whole machine is dismantlable so that any part can be easily replaced if required.

FURTHER DEVELOPMENT

TECHNICAL IMPROVEMENT

The rope-making machine requires at least two people involved. On the one hand, it is a great way to “get together” and enjoy teamwork. However, things can get complicated if only one person wants to engage in the activity. Therefore, the creation of a more automated machine could be the next step. The design could also be simplified and compatible with 3D printing, CNC, or laser cutting machines so that people could easily build their own machine in local fab-labs by following the blueprints, for instance.

UPSCALING APPLICATION

There is a natural curiosity to explore more options and uses of ropes. Learning knots or sewing/tying techniques would allow to upscale ropes into bigger artefacts.

FUTURE SCENARIO(S)

There are different future scenarios. First of all, I see the rope making machine as a tool for communities rather than individuals at home. It could be used in educational spaces like libraries, schools or hobby points and workshops that are open for the public across the cities. There is a potential of collaboration with the organisations that I have made a contact with at the beginning of my practical research, these are Verstas 24/7, JooSoap, Upcycle with Jing or Trash design. Plus, there are even more places in Helsinki like Weaving Kiosk which seems very open to enthusiasts of crafts.

We can picture even a more futuristic scenario of people living in a society where sharing upcycling machines in the common premises of apartment building is as normal as using washing machines, sauna or recycling bins. Furthermore, we can envision that those world countries where the management of textile waste is poor could benefit from Upcycling Textiles.

Certain goals can be achieved sooner than the scenarios above. For instance, sharing and promoting the project on various digital platforms could be the first step. Instructions and machine drawings could later be placed online to enable anyone for further distribution of the project.

LIMITATIONS

The project empowers everyone to be an upcycler, but does everybody want to become one? Making ropes is fun but preparing the process or producing a larger artefact can be labour-intensive and time-consuming. So, there is a risk that only a small percentage of people would be patient enough to continue upcycling of textiles on their own. In this case, clear instructions of how to terminate the ropes or other useful tricks that speed up the process of making are also important to share.

It is worth mentioning that not all textiles can be upcycled. If the material is poor and fragile, it will most likely not withstand the tension caused by the rope making process. In the end, the intention of Upcycling Textiles is not to solve the problem of waste, but enable everyone to reuse and upgrade their personal textile waste instead of throwing them away.

SELF – EVALUATION

Despite all the improvements needed, I am satisfied with the results of the project. I think the project meets most of the goals that were set at the beginning of the work. Not only did I build a rope making machine and do a few artefacts, but I went beyond the academic field by sharing my project in public that required confidence and courage.

The design phase was sometimes bumpy though, especially during the stage of building mock-ups. The process could have been a bit faster and smoother if I had more experience in mechanics and woodwork, despite that, I managed to gain knowledge on the way, for what I am very grateful.

A by-product of the project is the contacts that I made along the journey of the thesis. Engagement with a group of people allowed me to spread the matter of upcycling and bring more weight to the thesis. It was not only great to observe people's reactions and feedback, but also to upcycle textiles together in a playful way. In my opinion, rope making is a game-like practice that let people relax and open up for uncomfortable discussions related to sustainability. Many times the process of making turned passive visitors into active participants who were able to make something new out of wasted material.

Overall, Upcycling Textiles is a multi-layered project that is sometimes hard to place on one shelf. It has required different skills of a carpenter, manager, architect and designer. It only indicates that we will need more multidisciplinary designers to cope with a variety of challenges related to sustainability and environmental issues. Last, I hope that after closing the doors of the university, I will still continue the project.

HDW 2020. Photo: Ilkka Roitto

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